COAL AGE

Vol. 2 NEW YORK, AUGUST 3, 1912 No. 5

This foreword is presented by the president of an Ohio coal corporation.

We may look at the coal business in its manifold mechanical detail and close our eyes to the broad underlying basis on which it rests—the hope of reward. If we did not believe that it would sometime or other profit us, we would not engage in it, and the question of how to make the production of coal pay fair interest on the capital employed is worth more than passing thought.

It certainly does not yield a return commensurate with the investment, labor and risk involved, partly because there is always over-production when trade conditions are normal. But the economic stress is mainly due to the fact that a mine is like a horse, which eats when working or resting.

When the mines are shut down, the headings are caving, the roof is creeping, props are rotting, brattices failing, rails and pipe are rusting. Above ground the fixed force is idle, power is being used to pump water, the houses are empty and the stock in the store long awaits tardy sales.

So we work during some months of the year, not so much that we may secure a profit, as that we may shave an assured loss. Why coal should be one of the cheapest of all the necessaries of life never has been explained, and ten or even twenty cents a ton added to its price would not hurt a single one of the multitude of consumers. Many fair-minded purchasers are willing to concede that prices are too low, but they add with as much truth as frankness that the coal man has no one to blame but himself.

All the buyer wants is to stand on the same bench with his competitor. He will be satisfied if all his trade rivals also have to pay a little more, and while he is indifferent regarding the price set, we ourselves are condemning the industry to inadequate return and semi-bankruptcy. A dime or two more per ton would give a new lease of life to a seriously depressed business and make much needed ethical development possible.

We have arrived at the pass where we look to car shortages and strikes to give us temporary prosperity which should be ours all the time. It is not a healthy state of affairs to expect a profit only when the community is suffering from some abnormal condition.

The last word of modern industrial life is "Consolidation," but it is hopeless to rely on any unifying system which does not bind the coal trade of all the states in one, for the price cannot be raised in one district without the loss of entire coal markets to another. The country grows; the tonnage doubles every ten years. This would indeed be gratifying if the coal operators shared; but the profits travel the other way.

The answer given the operator always is "economize." But the question is too broad to be thus answered. When we all have plants representing the last word in economy, we shall still find that competition has robbed us of our due need.

[*The above remarks deal with the one subject lying closest to the heart of coal mining. Efforts to safeguard men and conserve supplies are hampered by the lack of capital caused by inadequate earnings. We are told every day "what to do", let someone tell us "how to do it." We are all agreed that the price of coal is too low. Can any of the Coal Age readers suggest a practical solution for this most vital problem. Unmeasured honor and lasting renown await bestowal on that individual who can let in the daylight.—Editor*].

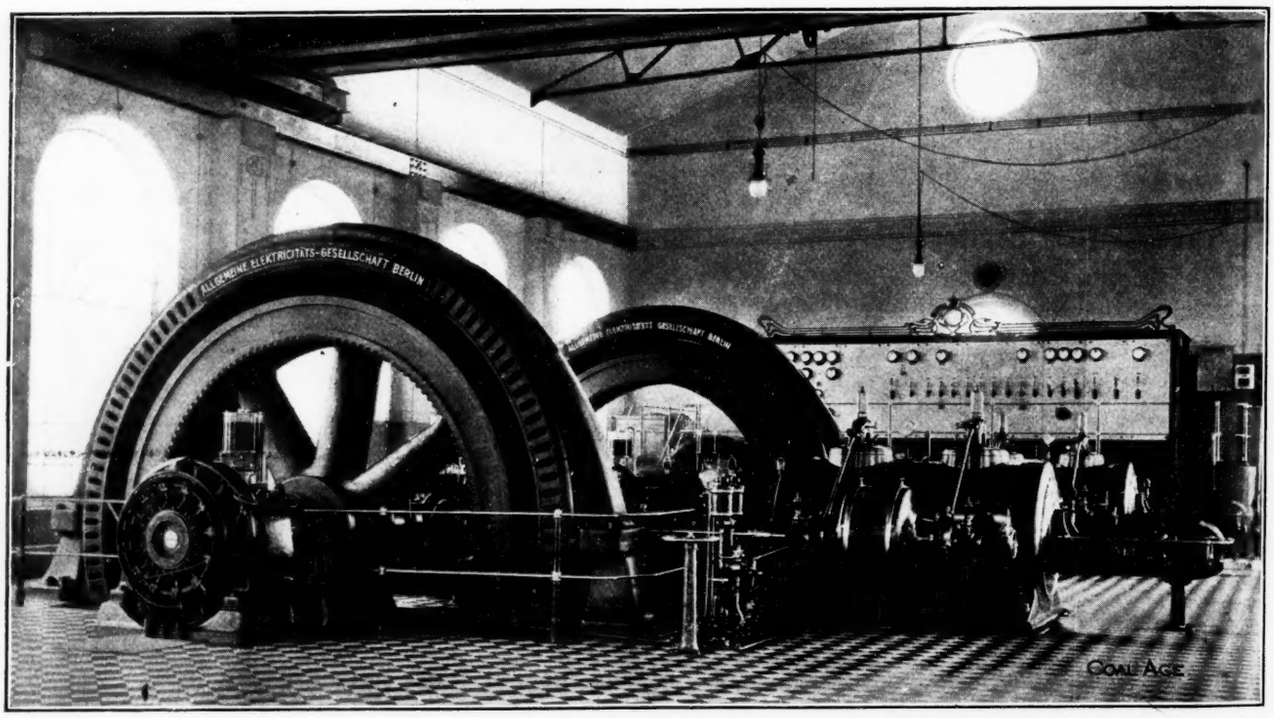
Electricity in Brown Coal Mines

By Our Berlin Correspondent

Electricity is rapidly forcing its way into briquetting plants and other branches of the coal industry. Until recently, direct current only could be used, owing to the wide range of regulation necessary, but later advances in electrical engineering have made possible the control of three-phase motors, without losses.

The great economical importance recently obtained by the brown-coal industry warrants us in pausing a moment in our consideration of the methods of using it. Particularly noteworthy features are not only the great demand for electricity in this field, but the extremely low cost of generation. In addition to the lighting of the brown-coal works, which eliminates the danger arising from the highly explosive properties of coal dust, electricity is frequently used to operate the entire plant.

If the power station is erected in the immediate vicinity from which the coal is extracted, the price of the coal used for power production is not increased by transportation and freight charges. Thus it becomes possible to utilize a coal which is low in heat value, and which would not stand the cost of transportation.



POWER PLANT OF THE MICHEL MINING CO., GERMANY, SHOWING THE 700-HP. ENGINES

It is evident that this factor may or may not contribute to the cheaper generation of power, according as the power station is, or is not, located near a mine. There is another factor, however, which does not depend upon the location of the plant. In the manufacture of briquettes, it is necessary that the coal be dried. This is usually accomplished by the aid of steam at a pressure of 28 to 45 lb., and, unless the exhaust steam from steam engines or turbines in a power house can be utilized, live steam will have to be especially generated. Hence, it is obvious that the cost of generating power at a brown-coal plant will be approximately the cost of raising this steam pressure from 28 to 45 lb. to, say, 170 to 185 lb. At this point it might be well to state that exhaust steam lends itself readily to this drying process, and the loss occasioned by incomplete expansion is recompensed by the work of the exhaust steam. Only a comparatively small surplus of fuel over the amount required to generate the steam at 45 lb. from the feed water, is necessary to raise the steam to an initial pressure of 180 lb.

ECONOMY OF ELECTRICITY

The uses for electricity in brown-coal mines are manifold. Electrically driven excavators are known to have advantages over those operated by steam power. They are simpler in operation, always ready for work, and avoid the energy consumption during intervals of idleness. The cost of upkeep is remarkably low, while the economy of the electric motor, as compared with the steam engine working noncondensing, scarcely needs mention. The illustration shows an electric excavator at work. Owing to the fact that the rail tracks have to be moved constantly to keep pace with the progress of the excavations the current conductors must be laid with the track.

Electric locomotives have found a comparatively recent use for the removal of rubble. As the height and width are limited by the fact that locomotives must be able to pass through the gantry of the excavator, steam locomotives could be constructed for a rather small output, and would require two or three engines, in case of heavy trains and steep grade. Electric locomotives, however, are designed as bogie-truck locomotives with four driving axles for outputs up to 400 hp., and will replace two steam locomotives of the largest type.

Apart from the economy in energy production, there is an appreciable saving in the item of labor. For an electric locomotive from 300 to 400 hp., only one man is necessary, while for the two equivalent steam locomotives, two drivers and two stokers would be required.

The further working of the brown-coal mine is carried out in a series of crushing and drying machines, connected together by vertical, horizontal or slanting transport devices. All these machines with the exception of the dryers rotate in the same direction at a practically constant speed. From this point of view only a steam-operated transmission shaft could

ELECTRICALLY DRIVEN EXCAVATOR WITH AN ELECTRICALLY PROPELLED TRAIN

be considered, but owing to the distribution of the machinery over different floors and buildings, such a scheme would give rise to so many drawbacks that the motor drive is the only practicable scheme. Belts are usually employed to transmit the movement from the electric motor to the machine.

As regards the kind of current to be used for supply by brown-coal works, the wide extent of installations entails the use of somewhat high voltages, thus keeping transmission losses within moderate figures with a small outlay for copper conductors, particularly if several works are supplied by one generating station or if electric light is supplied to the adjoining districts. Three-phase current is most adapted to this transmission, as its great advantages for motor service in view of the large number of individual drives, can be fully turned to account. For drives not requiring any speed regulation (as in the case of the pumping plant), the asynchronous motor with starting slip rotor is the simplest possible form of driving machine. After being once started up, such a motor requires no further attention; there is no friction of current conducting parts and no sparking.

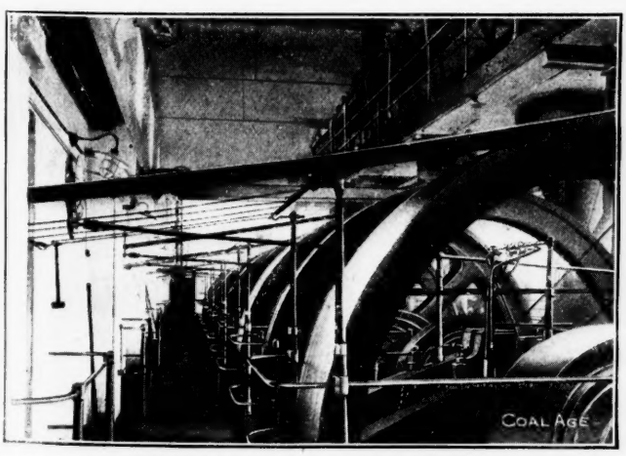
It is true that three-phase drive is not suitable for the excavation service already referred to. In this case transportable machines have to be dealt with, which receive their current supply through sliding contacts. Even when the rails are used as conductors for one phase, there are still two sliding contacts as compared with one contact for direct-current service. Here complications occur at points and crossings, which are particularly undesirable for this shifting system. Moreover the continuous current series-motor possesses indisputable advantages over the three-phase motor for locomotive work. Direct-current motors automatically reduce their speed on a steep grade and thereby the current, thus moderating the effect of sudden change of load.

These advantages of direct-current service are, however, not alone sufficient to warrant the erection of a direct-current generating station, using exclusively direct-current motors. The advantages of three-phase current for motor service and particularly for transmission, and the possibility of extensions without any large alterations in the plant, insure the superiority of three-phase supply. For the few forms of service requiring continuous current, three-phase, direct-current converters are provided; the small losses entailed by this conversion are negligible in view of the low generating cost.

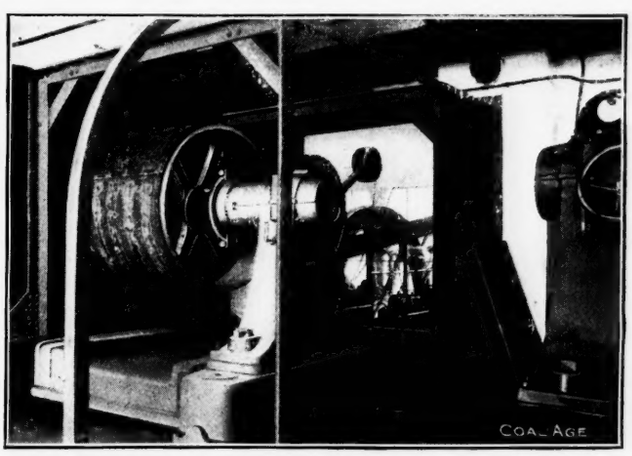
ADVANTAGES OF DIRECT CURRENT

Until a short time ago, the direct-current motor possessed another appreciable advantage for brown-coal works, namely, in its wide range of regulation. In fact, the construction of three-phase motors capable of regulation without losses is one of the most recent advances in electrical engineering.

The belated introduction of electrically driven briquette presses is due to the belief that the demand for drying steam could best be met by a steam service. The uneconomical working of the engine was overlooked, because exhaust steam could be used for drying. As long as



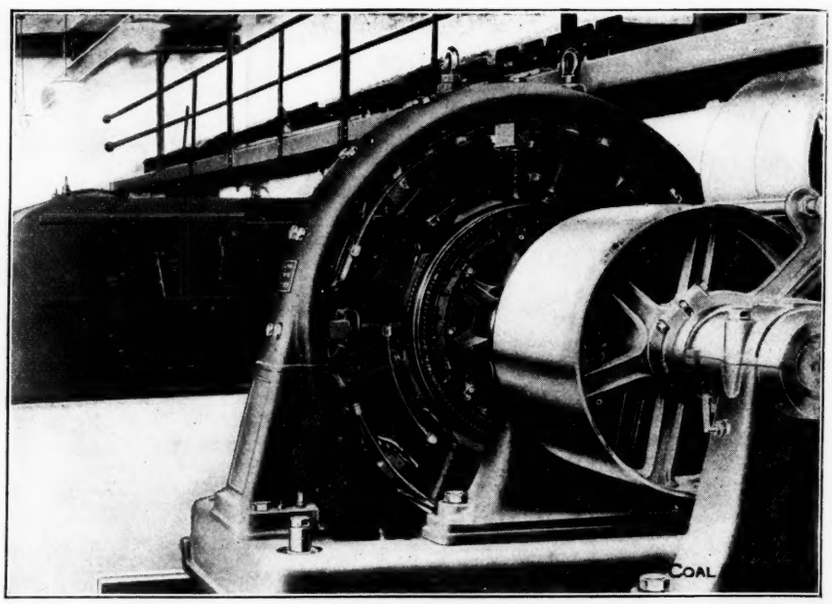
PRESS ROOM, SHOWING USUAL ARRANGEMENT



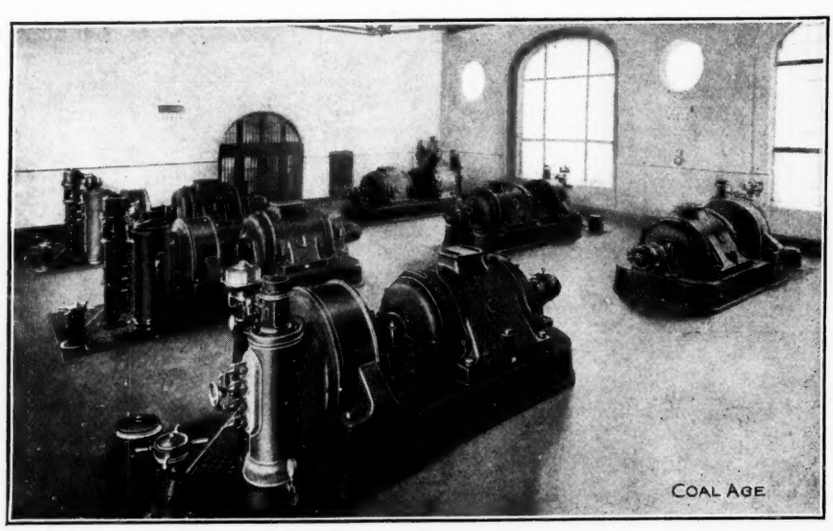
LENOX DRIVE TO TAKE UP BELT TENSION

steam power was employed for the various forms of service, outside of the briquette factory, and the demand for electric energy, therefore, was not very great, this system was quite justified. When electricity was also employed for excavation service, however, it became desirable to obtain large outputs from the power house, and in consequence of greater capacity of steam dynamos, the sudden loading caused by the excavation service was no longer objectionable. An additional load of this kind was found in the electric driving of briquette presses. The increased output of the steam unit and electric generators entails an increase in economy, large machines having a better efficiency than small ones.

In spite of the many advantages of electric operation, its adoption for the driving of briquette presses took place comparatively late, because of unsatisfactory results of trial tests. The trials conducted by the Allgemeine Elektricität Gesellschaft were entirely successful,



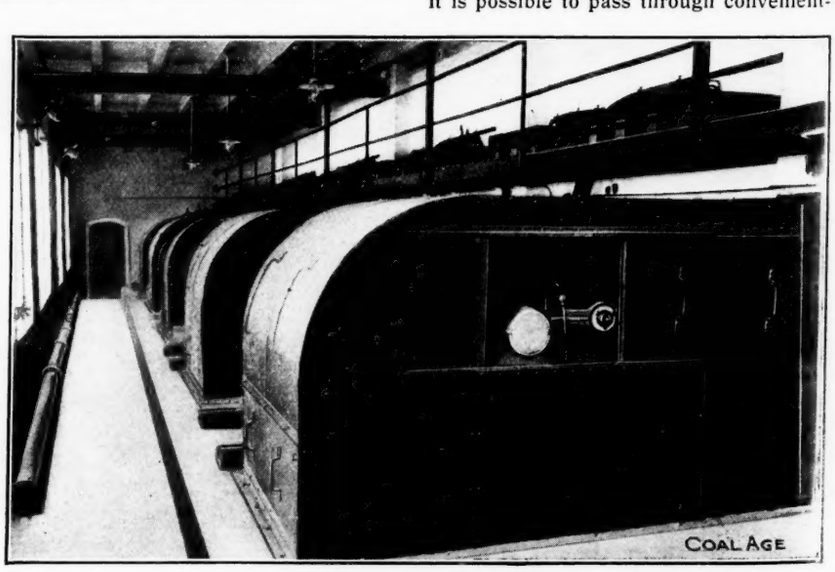
MOTOR PULLEY AND BELT TIGHTENER



GENERATING STATION WITH 5 BACK-PRESSURE TURBO-DYNAMOS

however, resulting in the electrification of their six briquette presses. On account of the coal dust polluting the air in the press room, the 180-hp. motors were erected in a special room. The speed of the motor can be regulated from 300 to 600 r.p.m., according to the quality of briquettes. The mold is inserted at a very low speed on no load; preliminary pressing takes place at a press speed of 30 to 40 r.p.m., at considerable expenditure of power for which flywheel compensation can hardly be obtained on account of the low speed. As direct current, at a tension of 500 to 525 volts, is available at the mine, direct-current motors were employed, which are heavily compounded in order to insure a powerful starting torque. Thus they were capable of exerting a torque about three times that of the starting torque for the final pressing, in case of a momentary unforeseen stoppage of the press. In order to prevent any injurious sparking at the commutator within the entire range of regulation, the motors are provided with commutating poles.

Power is transmitted from the motor to the press by belt and gearing. To this effect one flywheel of the press is designed as a pulley. In order to reduce the effect of load variations on the motor under normal working conditions a Lenox tension pulley is provided. The separation of the motor room from the press room is effected by placing a sheet-metal casing around the motor pulley and the bearing belonging to it, which completely closes up the motor room. Inspection openings are provided in the casing and are closed by slides. The illustration affords a view into the press house, from which the front wall has been removed. The height of the belt, which runs through the wall, has been so chosen that it is possible to pass through convenient-

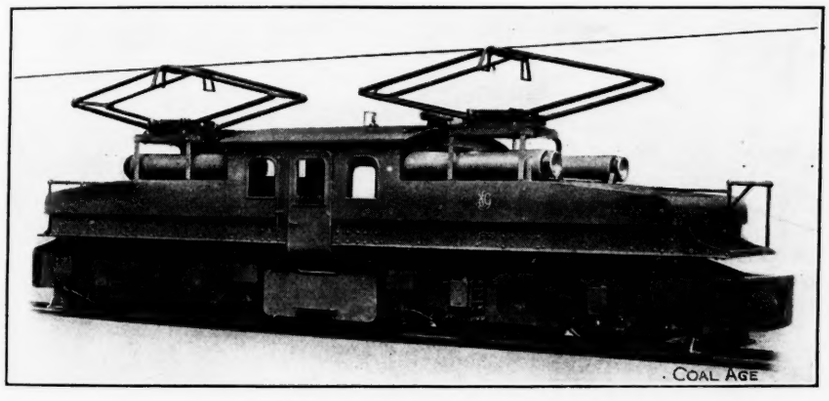


MOTOR ROOM FOR BRIQUETTE PRESSES

ly. The motor can be moved on slide rails, which enables the tension of the belt to be adjusted.

Regulation of the motor speed between 300 and 600 r.p.m. is effected solely by field resistances mounted on a platform as in the figure. These resistances are controlled by means of a controller-type starter, which is operated from the press by rods and a chain transmission. An indicating device informs the attendant, by means of a pointer moving over a circular scale, as to the step the starter or regulator is on at any moment. The entire operation is carried out from the press, so that a motor attendant can be dispensed with altogether. In the switch-case behind the bearing there is in addition to an ammeter, a maximum and "no-volt" release mounted, which operates on over-loads or on the failure of voltage in the line. Its operation is indicated to the attendant by an alarm. Furthermore, if the maximum permissible speed is exceeded, a centrifugal switch comes into action and automatically stops the motor.

This plant has been in satisfactory operation since the beginning of the year.



A 376-HP. SURFACE LOCOMOTIVE

Briquette-press drives are, of course, not confined to direct-current motors, which until recently were the only type available in this connection, because of the extensive range of speed regulation required. A new type of three-phase commutator motor, which can be regulated without any losses, has been in successful operation, so that three-phase current can now be also employed for working the presses.

It is, therefore, merely a question of economy in new briquette plants whether the presses are to be driven electrically or by steam. According to a German expert, Mr. Leuner, a steam drive should be considered only when the exhaust steam from the power station does not suffice to cover the demand for drying steam, so that some live steam has to be added. If the quantity of exhaust steam from the power station just suffices for drying, then steam and electric operation are equal to one another. If, however, the output of the electric power station, and, therefore, the available quantity of exhaust steam, exceed the requirements of the dryers, the electrification of the presses is doubtless the most suitable scheme.

These results are obtained, however, under assumptions by no means favorable to the electric drive. As a matter of fact, the efficiency of the motors and particularly the belt drive would seem considerably to exceed the figures on which the calculation is based, so that even when the quantities of exhaust steam and drying steam balance one another, electric operation is still advantageous. Another conclusion from the same article which is indisputable, is that the complete electrification of brown coal works, and the high thermal efficiency attained thereby, would result in a very considerable reduction of the generating costs for electric current.

How Explosives Act

"The Effect of Stemming on the Efficiency of Explosives," Technical Paper No. 17, is the latest publication issued by the Bureau of Mines. The authors, Walter O. Snelling and Clarence Hall, in their introduction say:

"All commercial explosives owe their power of doing work to the expansive force of the great volume of gas evolved from them at the moment of explosion. The pressure exerted by this gas in the drill hole or other confined space in which the explosion is brought about is what makes explosive substances of value in mining or other industries and is the primary cause of all those manifestations of energy that follow firing a charge.

"Common black blasting powder, on explosion, produces about 390 times its own volume of permanent gases; 40 per cent. dynamite produces about 530 times its own volume of permanent gases; and nitro-glycerin produces somewhat more than 747 times its own volume of permanent gases. These proportions of volume of gases to volume of explosive are those that would be found if the gases were measured under normal conditions of temperature and pressure, but at the moment of explosion the gases are highly heated, and therefore tend to occupy a volume much greater than the figures given above.

"The experienced miner knows that for a slow-burning explosive, such as black blasting powder, a considerable amount of stemming must be firmly tamped in the drill hole in order to produce such confinement as is required to obtain the maximum effect from a shot. Dynamite and similar explosives, however, give very powerful effects without being confined at all, and so some miners have come to believe that dynamite and other "high" explosives do not require stemming, and that rock can be broken as effectively by firing cartridges of explosive in a drill hole without stemming as by using well-tamped stemming to confine the charge. But this belief is by no means general. It has long been noted that those miners who have greatest success in the use of "high" explosives have recognized that earth or clay should be used as a stemming for all shots, and that the careful tamping of these materials into place increases the effect of a blast.

"The structure of rocks and the direction of cracks and partings are so variable that it is quite impossible to drill in a face of coal or rock two shot holes absolutely alike and representing exactly the same conditions. Hence it is impossible to make in a mine or quarry a test that would settle definitely the question of just what advantages are gained by the use of stemming with "high" explosives. By comparative tests much evidence has been gathered to show that shot holes in which a large quantity of well-tamped stemming is used give better results than those in which no stemming is employed, but from the lack of definite proof that the conditions in the tests were identical, this evidence has not been sufficient to convince those miners who do not believe that stemming increases the efficiency of a shot."

W. C. Cope and A. J. Hazlewood fired the shots and made the experiments described in the paper from which this is an extract. The bulletin may be obtained by writing to the director of the Bureau of Mines, Washington, D. C.

Our Front Cover this Week

The photograph shown on the front cover of this week's issue of COAL AGE is a view of the power house of the Wearmouth Collieries Company, Northumberland, England. This power installation is modern in every respect and consists of four Ingersoll-Rand class "0-3" cross-compound, steam, two-stage air-compressors. Cylinder dimensions, steam, are 14 in. and 27 in.; air, 22¼ in. and 13¼ in.; 21 in. stroke; capacity, 160 r.p.m. There is 1392 cu.ft. of free air per minute to a pressure of 80 to 125 pounds.

Coke Quenching and Loading Devices

Special Correspondence

A brief outline of the current practice in mechanical loading and quenching with special reference to the chain conveyor type of machines. Among the difficulties encountered on installations of this kind, the most important is that due to the excessive contraction and expansion as a result of the great range in temperature.

The mechanical engineer engaged in the design and construction of prime movers, machine tools, and machinery for the transmission of power is apt to look with some contempt on the apparently rough and ready appliances used for the transport of materials. A little consideration, however, will convince him that there are many interesting points in the design of machinery for the handling of gritty substances, and particularly in apparatus for mechanically removing such a material as incandescent coke.

Difficulties to be Overcome

The greater part of the coke is a by-product in the manufacture of illuminating gas. Coal is distilled in retorts which are generally arranged horizontally in benches and heated by the combustion of producer gas generated in the lower portion of the setting. Most retort houses are built with a stage floor, are generally 20 ft. through, and are charged with from 7 to 10 cu. ft. of coal. When the gas is driven off there remains a residue of from 5 to 7 cu. ft. of coke, which is discharged at one or both ends of the retort at intervals of from 4 to 8 hours.

The nature of the coke has next to be considered. It is very friable, and is discharged at a temperature of not less than 1800° F. Its monetary value depends on the size of the pieces and their appearance. A sample of coke having lumps of 3 to 6 in. with a silvery lustre and no dust will be worth as much as $4.32 to $4.80 per ton. The dust or breeze will be worth from 96c. to nothing per ton. This brittle, hot material is to be removed from the retort bench, quenched with a minimum of water, screened and loaded on cars with the minimum of breakage.

It is also to be borne in mind that any machinery which comes into contact with coke or breeze will be worn away in a very short time. Many types of conveyors have been used for handling hot coke. It is, of course, obvious that nothing but metal can be employed in their construction and it is also obvious that any conveyor with working parts, like wheels or rollers, running in contact with breeze, will not last long.

The Conveyor Systems

The conveyor trough consists of a light steel shell and a hard cast-iron renewable lining. It is placed on the stage floor in such a position that it will readily receive the coke pushed or drawn out of the retorts. The conveyor chain moves along the bottom of this trough at a speed of from 35 to 45 ft. per minute, and water is sprayed into the trough so that the coke is cooled as it moves along. In the construction of this trough or channel, allowance must be made for very considerable expansion and contraction due to the temperature of the coke and the introduction of water.

The type of chain in most extensive use, is very simple. It consists of two parallel strands of block link chain with flat or round cross bars at intervals of about 2 ft. The coke is simply dragged along the bottom of the trough by these cross bars; cover-angles are bolted to the sides of the trough, to protect the chains. Generally a drum with a sprocket wheel each side is arranged at the drawing, or delivery, end of the conveyor, the coke being pitched over the end, though sometimes delivery is effected by allowing the coke to fall through the bottom of the trough just before the chains pass round the sprocket wheels. The return chains slide along paths consisting of steel angles to which the cast-iron renewable strips are generally bolted.

Some simple form of tension gear is provided to keep the chain suitably tight, while allowing for the expansion and contraction of the chain under heat. This may consist of sliding bearings for the shaft of the end wheels to which are attached suspended weights; all parts of this chain are made from drop-stamped forgings.

Objection has been raised, however, to dragging the coke along a trough as it is bound to result in the making of breeze, and although there is actually very much less breakage in the conveyor, than by the fork and wheelbarrows of the old days, many attempts have been made to devise a conveyor which would carry the coke instead of dragging it. The tray conveyor with its wheels and moving parts, has not proved satisfactory and while it is true that there are still some examples of this type at work, it cannot be said to be in general use.

Single Chain Conveyors

One of the most interesting attempts, and apparently the most successful at solving the problem consists in the application of a special single chain, which possesses several novel features. The essential feature is the block link in the form of a "gend" or "frame", which is nearly sufficient to carry the coke. A further reference to the nature of the material to be transported is here necessary.

Coke very readily forms a sort of natural arch by the interlocking of adjacent pieces. Therefore, if a good sized piece falls on a link, it will not only ride on the chain itself, but other pieces will cling to it, and a very large proportion of the coke will never come in contact with the trough at all. In practice these expectations are abundantly realized, and it is a very striking spectacle to see a mass of incandescent coke move about on the retort house floor with that entire absence of disturbance which proves that there is little or no rubbing between the coke and the trough.

No pretence is made at protecting this type of chain from the coke; the joints are right in the middle of the charge. But these joints are made very long (about 7 in. long on a 1½ in. diameter pin), so that wear is very slow. The block link is a malleable-iron casting, the connecting links are drop-stamped, and the pins of mild steel with ends milled to shape. To the mechanical engineer, probably the most interesting point about this chain, is the connnection of the links: this is effected without the use of any split-pins, bolts, or cotters whatever. The connection is made by the use of nothing more than the pins and the links.

The very low speed at which these conveyors are operated opens up many interesting problems. Contrary to what might have been expected, the consumption of power is not great, 3 hp. being sufficient to work a conveyor 100 to 150 ft. long on the horizontal and handling about 20 tons of coke per hour. The revolutions of the drawing shaft of the conveyor are generally no more than 4 or 5 per minute, and in the second type of conveyor described, where the pull is necessarily in the center of the shaft, a large bending moment has to be allowed for in addition to the considerable twisting moment. It is therefore no surprise that in long conveyors these shafts may be 4 and even 6 in. in diameter. Again, the reduction in speed of an electric motor running at, say 600 r.p.m. to 4 r.p.m., renders it necessary to use wheels of unusual pitch, the last pair often being of 3 in. pitch and made of cast steel.

The World's Largest Bunkering Port

Special Correspondence

A brief résume of methods and conditions prevailing at the Cardiff, South Wales, coaling station. This is one of the earliest bunkering ports, and at the present time is handling more coal than any other fuel station in the world. The mechanical equipment is such that heavy tonnages may be handled with the minimum of breakage.

Cardiff and coal are two words quite suggestive of each other, but the position of Cardiff as the premier coal port of the world has not been attained without a struggle. The wealth of South Wales itself is, of course, due to its great coal resources. The industrial population of all Glamorganshire owe their livelihood to the coal industry and the port of shipment of the greater part of the production of the mines is Cardiff, whose docks were originally built and financed by the Bute family. The dock property is still principally owned by the Marquis of Bute, though operated by the Cardiff Railway Co., which was created in 1887. All through their career there has been no lack on the part of the Bute family to render service to the public.

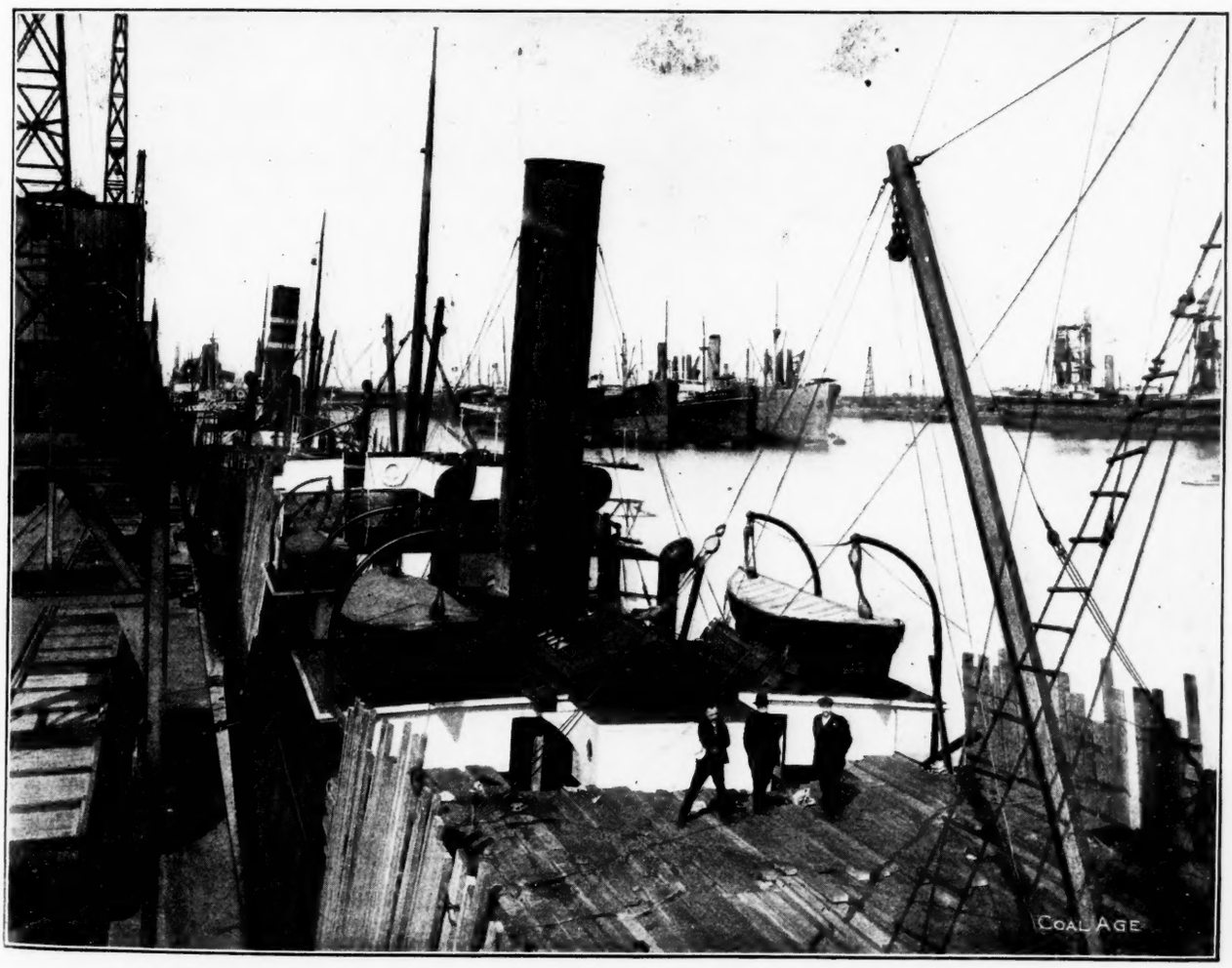
Early History

The Cardiff Docks were commenced in 1839 and the Bute West Dock was completed and opened in that year. This dock has an area of 18 acres and is 4000 ft. long by 200 ft. wide while its quayage is 8800 ft. in length. In addition to warehouses and transit sheds on the quay side for the storage of goods there are twelve staiths* for the loading of coal. Close by and leading out of the dock is a dry dock 235 ft. long, with a depth of 12 ft. and an entrance 40 ft. wide.

*Coal loading or transfer platform.

The East Bute Dock was constructed in 1855 and an addition was made to it four years later. It is in direct communication with the sea by a lock 200 ft. long and 55 ft. wide. The dock itself has an area of 44 acres, and is 4300 ft. long and from 300 to 500 ft. wide, with 9360 sq.ft. of quay space. There are 19 staiths, for the shipment of coal, three hydraulic ballast cranes, capable of discharging 100 tons per hour, and 36 hydraulic cranes with capacities of from 2 to 20 tons, while leading from the main dock are three dry docks.

In 1874 the Roath Basin was opened with an area of 12 acres. It is provided with 9 staiths for the shipping of coal; these are chiefly moveable and with a moveable crane, thus enabling a vessel to load at each hatchway without moving. Adjoining this is a dry dock 600 ft. long and so arranged that vessels can dock irrespective of the state of the tide. Leading out of the Roath Basin is the Roath Dock which was first used in 1887. It has an area of 33 acres and is 2400 ft.



General View of the Queen Alexandra Docks, the Largest Coaling Port in the World

long, with a quayage of 7520 sq.ft. The equipment of both of these docks is of the latest type, and at the Roath Dock are the cold stores for dealing with perishable cargoes.

The largest and latest dock is the Queen Alexandra, opened by the late King Edward VII on July 13, 1907. It has an area of 52 acres with a second deep-water entrance to the Roath Dock, making a total water area available for shipping of 85 acres. With two independent exits it may be worked as either one or two docks and is capable of dealing with the largest vessels. The south side of the dock is devoted exclusively to coal shipping appliances, and two transit sheds, cattle lairs and chill rooms, as well as hydraulic cranes capable of handling up to 70 tons, have been provided.

Tonnages Handled

That Cardiff has prospered exceedingly well is shown by the following table of imports and exports for the years stated:

Years	Imports	Exports	Total
1880.....	1,141,313	7,145,102	8,286,415
1890.....	1,626,562	12,573,283	14,199,846
1900.....	2,526,943	18,709,413	21,236,356
1910.....	2,734,113	24,033,081	26,767,194

Although coal is the chief feature of Cardiff's trade, there is a substantial quantity of pitwood, iron ore, grain, timber, etc., imported and the port now ranks after London and Liverpool as the largest importer of frozen meat.

The total shipments of coal handled at this dock in 1840, a year after it had been opened, was only 43,651 tons, but in 20 years this had increased to 1,794,005 tons, and in 1900 to 18,029,167 tons, and in 1910, the latest returns issued, over 23,141,555 tons were shipped.

The heating value of the best South Wales coal is very high, and being smokeless the engineers of all the principal steamship companies, as well as the British Navy, regard it as the finest coal in the market. One colliery in the Glamorgan district has been producing for some 50 years and is now evincing renewed activity, owing to the substitution of electricity for steam.

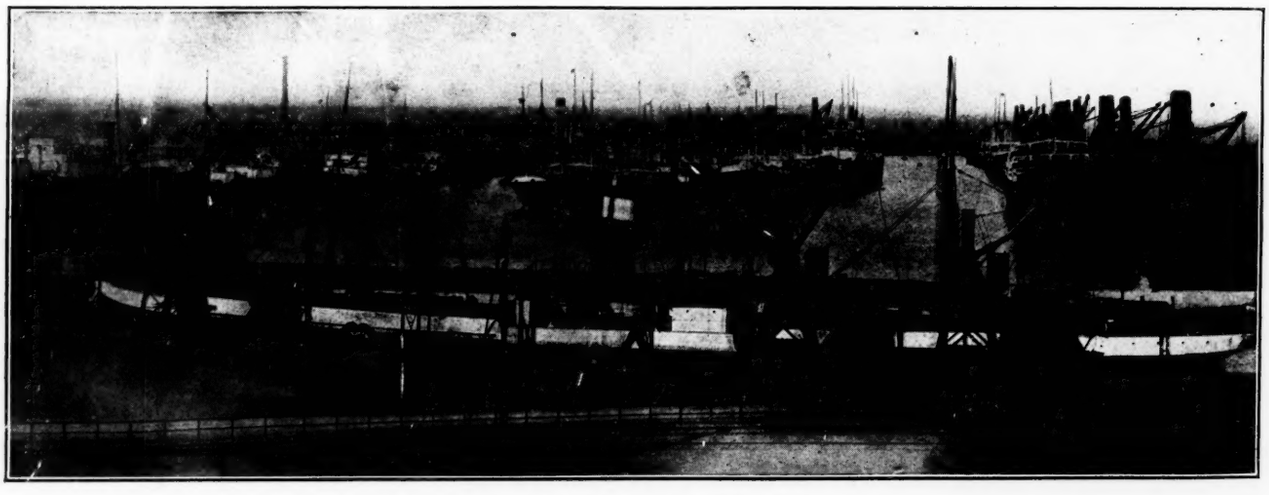
The railway cars are usually lifted at right angles to the lines of the quay by means of an hydraulic hoist or shoot. The platform carrying the rails is hinged to the main table of the hoist along its outer edge, and is provided with subsidiary tilting gear to incline the wagon and discharge the load into the spout as soon as the main lifting gear has raised the whole to a suitable level. This is the system in force at most of the docks in Great Britain; but at the Bute and Queen Alexandra Docks at Cardiff, there is a special patent in use called the Lewis-Hunter Coaling Cranes.

Lewis-Hunter Coaling Cranes

By this system the car is dumped into a large box, which in its turn is deposited in the vessel's hold. This appliance, which is shown in the accompanying halftone, consists of a rectangular box, with a movable bottom; it is made of cast iron and pyramidal in shape. The main crane chain is attached at the center and carried through a guide in the hood of the box so that when being lifted by the chain it will still keep right side up. Attached to each side of the guide of the main lifting chain are two other chains, also attached to the crane, and when the box is being emptied these two latter chains support it. The action of the box is as follows:

It is first lowered empty into a pit three-quarters the height of the box in depth and with the mouth of the box facing a dumping platform at one end of the pit. The car is brought on to this platform and its contents dumped into the box by an hydraulic tilting apparatus; the hood of the box serves to prevent any of the coal shooting into the bottom of the pit.

After dumping, the car is taken off, shunted along with the other empties, and a full one brought on to the platform. While this is being done the full box is lifted by the crane, swung over the side and lowered into the hold of the vessel. When the box is almost touching the bottom of the hold the weight is taken on to the two chains attached to the top of the hood, the pyramidal bottom being thus lowered out, and the coal sliding down the inclined sides is deposited very gently into the bottom of the hold. When the box is empty it is hoisted up by the chain attached to the pyramidal bottom, lowered into the pit and again filled from



General View of Roath Dock, Cardiff

FOREIGN EXPORTS FROM PRINCIPAL PORTS OF GREAT BRITAIN

Year	Cardiff	Newport	Swansea	Port Talbot	Tyne Ports*	Sunderland	Blyth	Hull	Glasgow
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
1880	4,897,440	1,032,572	796,761	Included in Swansea.	4,926,295	1,236,583	189,691	588,323	234,736
1885	7,132,133	1,767,791	846,627		5,125,898	1,427,170	462,354	617,712	542,772
1890	9,481,802	1,970,014	985,658		5,396,343	1,451,231	1,433,941	952,898	764,319
1895	11,067,403	2,428,308	1,175,419		5,206,399	1,669,627	2,050,997	946,296	754,807
1900	13,461,027	2,779,013	1,859,747	282,138	7,476,780	1,940,882	2,684,500	1,870,072	1,131,191
1905	14,080,855	3,007,990	1,928,459	726,103	8,827,508	2,417,937	3,206,090	1,711,551	1,522,815
1906	15,940,784	3,572,567	2,532,697	1,004,845	9,815,103	2,321,472	3,277,298	2,497,243	1,535,369
1907	17,369,175	3,821,892	2,803,413	1,260,707	11,291,828	2,499,156	3,361,181	3,526,197	1,691,207
1908	16,761,374	3,931,537	2,933,904	1,299,329	12,407,941	2,499,336	3,398,480	2,878,997	1,928,861
1909	17,054,031	2,824,167	2,856,452	1,243,486	12,261,978	2,610,560	3,393,648	3,236,538	1,907,422
1910	16,931,403	3,808,376	2,703,362	1,409,032	10,828,515	2,455,005	3,508,920	3,729,659	1,945,977

* Includes Newcastle, North Shields and South Shields.

the car already brought to the dumping cradle.

There are, of course, two drops, if the discharge of the box into the hold can be called a drop, the second being small, varying from 10 ft., when the box is empty, to nothing when full. The boxes are made in two sizes, one for the ordinary 10-ton wagons and one for handling a smaller one, generally of 7 tons; the smaller one, however, is being gradually superseded by the 10-ton or even larger boxes. The ones at the Queen Alexandra Dock are capable of dealing with 20-ton cars.

There is no doubt that even larger wagons could be dealt with, as the only modification needed would be in connection with the dumping cradle, though the cranes would, of course, have to be made capable of handling the increased weight. The Cardiff Railway Co. has the exclusive right to use these cranes in the Bristol Channel, and they have proved by far the most satisfactory methods of handling coal with the maximum of dispatch and the minimum of breakage. It is claimed that screened coal shipped by these staiths is equal to the double screened product handled by ordinary staiths, besides insuring a great saving in breakages.

Efficiency of Apparatus

Three or more cranes can be worked simultaneously on one vessel, and as much as 330 tons have been handled by a single crane in an hour while 6715 tons have been loaded on in 11 hours or an average of 610 tons per hour. Many trunk and turret steamers load full cargoes of coal by these cranes without any manual labor whatever, and shippers attach so much importance to them that they frequently elect to wait for a berth rather than have their coal shipped from the usual coal staiths.

The anti-breakage apparatus, first used some 20 years ago, saves at least 7½ per cent. in loading South Wales small coal, as compared with the loading methods in use in other parts of the coal field. South Wales coal is the most friable, and this additional saving arises from the fact that the box is delivered right into the vessel and therefore eliminates the fall, which in some cases is very considerable, and especially at night-time, when such close supervision to the work cannot be given.

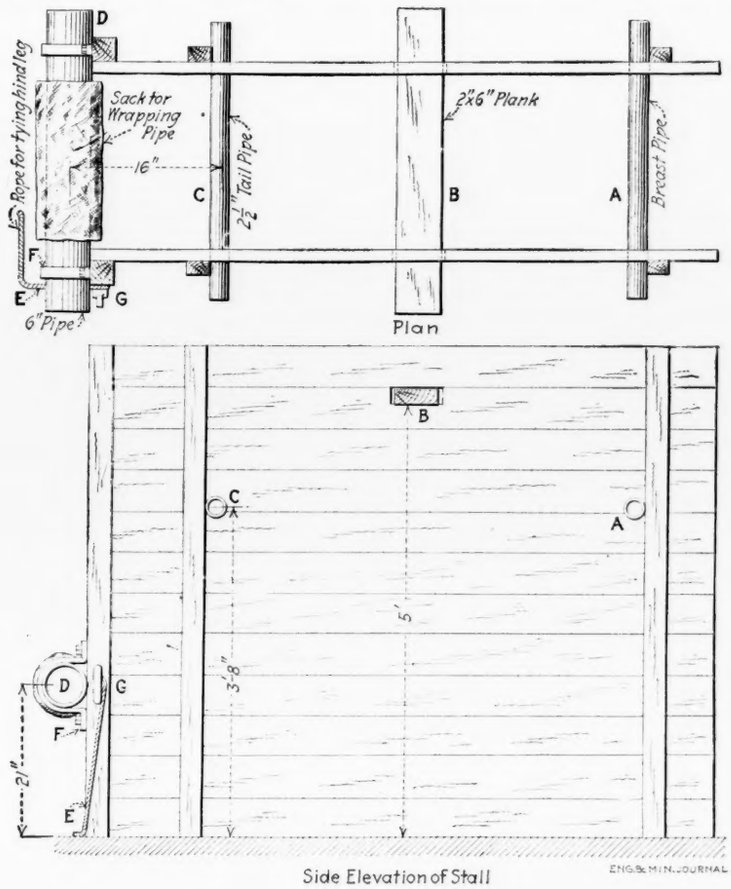
Cardiff has often been dubbed the "Chicago" of Wales; but the title is rather inappropriate as Cardiff has long historical associations, of which its inhabitants are duly proud. If an American comparison is needed, and to readers of Coal Age it is certainly helpful, she resembles San Francisco rather than Chicago. The trade facilities and its command of raw materials, gives Cardiff an unrivalled place among the ports of the world.

Shoeing Mean Mules

The *Engineering and Mining Journal* is responsible for putting up the following "job" on "onery" mules:

Trouble is often experienced in shoeing mules, especially underground. In the accompanying sketch the general features of a shoeing stall are shown, which has been built at one of the shafts of the St. Louis Smelting & Refining Co., in the Flat River district of southeastern Missouri.

This stall is made narrow so that the mule has not much leeway. There is a pipe A at the manger or head end of the stall against which the breast of the mule comes. This is put in after the mule has been forced back against the other pipes and board that are used to restrain him. By this breast pipe he is kept from moving forward; by the board B that is put in over his back the mule is kept from rising up so as to be able to kick; by the pipe C, which is put in at the same height as the breast pipe, the mule is kept from backing out of the stall; and by the pipe D, which is wrapped with old gunny sacks to prevent the mule from injuring himself, he is prevented from kicking.



Stall for Shoeing Mean Mules

In shoeing a mule the foot that is to be shod is raised up over the pipe D, which is held in the iron straps F, bolted to the back posts of the stall, and then is tied by the rope E that is fastened to the cleat G. By this rope the mule is prevented from jerking his foot back out of the shoer's grasp.

The mule can be turned around and his front feet shod in this stall if he causes trouble by not standing still or by trying to strike the man. Some mules give trouble in being shod by laying their weight on the man during the shoeing. This can be remedied by rigging up a swing and putting a band or surcingle around the mule and swinging him so as to take his weight off the shoer.

Danger from Trolley Wires

A frequent source of mine fires is faulty insulation of trolley wires. They should be inspected frequently as the moisture and water dripping from the roof quickly injure the best of insulation.

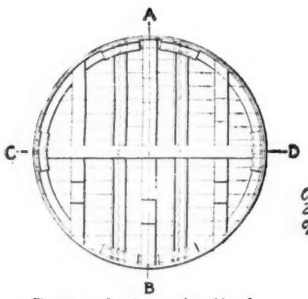
Trolley wires should not be attached to the roof or come in contact with props, doors or brattice-cloth. All wires should be located uniformly 6 to 8 in. outside the rail and should be equipped with section-line switches. If the height of the crosscuts and the nature of the roof permit, machine wires, positive and negative, should be attached to the roof with the end of the negative attached to the last bonded rail. This method is simple and easily kept in order, as the wire is better cared for and trouble easily located. Cover trolley wires with inverted troughs where men or mules must pass under them. Ground all transformer cases, controller frames and oil-switch frames. Cross-bond all switches.

A Large, Heavy Duty, Timber Bulkhead

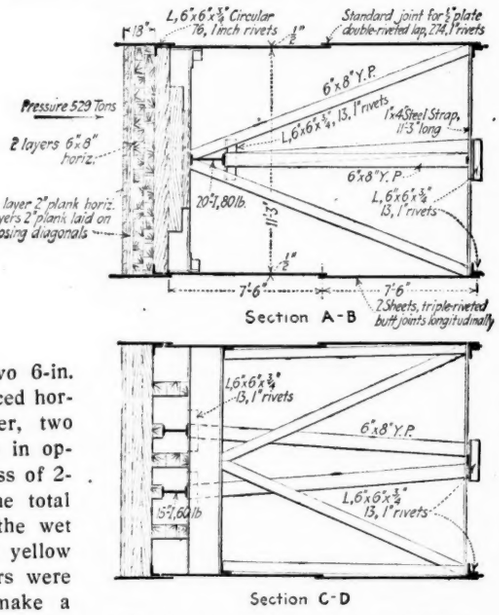
By Arthur W. Tidd*

The total load to be carried by the bulkhead was about 529 tons, the head being 168 ft. The contractor made a design for a wooden bulkhead held in place by steel I-beams and angles and timber braces. The bulkhead was built as designed, and the work was done so thoroughly that the leakage amounted to only about 5 gal. per minute, and at no time was there any outward indication of strain. When it was taken down, a well defined mark was visible where the timbers rested against the circumferential 6x6-in. angle, but elsewhere there were no evidences of distress. The design is shown in the accompanying sketches.

The bulkhead was built up, beginning



Elevation of outer or dry side of bulkhead with timber braces removed



Temporary Bulkhead for 168-ft. Head, at South End of Bryn Mawr Siphon

on the outer or dry side, of two 6-in. thicknesses of 6x8-in. timbers placed horizontally one on top of another, two thicknesses of 2-in. plank placed in opposing diagonals, and one thickness of 2-in. plank placed horizontally; the total thickness from the dry side to the wet side was 18 in. The timber was yellow pine throughout. The 6x8 timbers were beveled on the water side to make a calking joint about ⅜ in. wide at the face and about 3 in. deep. This was filled by driving a small amount of cotton batting into the bottom of the joint, then oakum to within about ½ in. of the face, and then the remaining space throughout pointed with neat portland-cement mortar. The 2-in. plank (shiplap) had its joints calked on the inner or water face, as described.

The inner face of the inner thickness of 6x8 timbers and the inner face of the outer thickness of 2-in. plank were painted with coal-tar paint. The circumferential joint between the ends of the three thicknesses of 2-in. plank and the steel pipe was calked with cotton batting as each layer was put on; only the inner thickness was pointed with cement. The two thicknesses of 6x8 timbers were spiked to each other and to the 6x8 uprights with 10-in. boat spikes, and the three thicknesses of 2-in. plank were spiked with 5-in. wire spikes.

The load was transmitted to the steel pipe with which the tunnel was lined through the following system: A circumferential 6x6x¾-in. angle was riveted to the pipe with seventy-six 1-in. rivets against which the outer thickness of 6x8 timbers abutted. The face of the bulkhead was held directly by five uprights, three of which were 6x8-in. timbers and two were 15-in. by 60-lb. I-beams, bearing at midheight against a horizontal 20-in. by 80-lb. I-beam. The two vertical I-beams abutted at each end against a 6x6x¾-in. angle 2 ft. long, riveted to the steel pipe with thirteen 1-in. rivets. The horizontal 20-in. I-beam abutted at each end against a like angle, fastened in the same way.

From the center of each of the two vertical 15-in. I-beams two 6x8-in. timbers about 15 ft. long extended respectively to the top and bottom of the pipe, footing against a similar 2-ft. length of 6x6-in. angle. From the center of the 20-in. I-beam two 6x8-in. timbers about 13 ft. long extended in the horizontal plane to either side of the pipe where they each footed against a like angle lug, and each of these lugs also held a 6x8-in. timber about 12 ft. long, extending from the end of the 20-in. I. The four short 6x6-in. angles against which the eight inclined braces footed were in the same plane, normal to the axis of the pipe, and located at the ends of the vertical and horizontal diameters. To prevent deformation of the steel pipe by the outward thrust of the braces, two steel tie-bars, 4x1 in. by 11 ft. 3 in. long, one vertical and one horizontal, extended across the pipe and were riveted to these angles with two 1-in. rivets in each end of each tie-bar.

The distribution of the load among the different members is indeterminate but an ample factor of safety was provided, which, of course, should have been done considering the number of lives that would have been lost if an accident had occurred. The workmanship was excellent throughout, all braces being cut to fit and very few wedges used or required.

As a safeguard against possible ignorant tampering with the bracing or bulkhead, the end of the pipe was boarded over and a door with a padlock provided for gaining an entrance. A careful daily inspection was also made, but no weaknesses or leaks developed, nor were any repairs required at any time.

*Asst. Engr. Board of Water Supply, New York City: 215 Kimball Ave., Yonkers, N. Y.

Note—A description of a bulkhead used in the aqueduct for the new water supply for New York City; the total length of the aqueduct will be 92 miles. Excerpt from "Engineering News," July 25, 1912.

Panama Mine Disaster

The coroner's jury, which heard the examination of the witnesses in the investigation of the gas explosion at the Panama Mine, July 11, has returned a verdict of criminal negligence on the part of the officials operating the mine. An extract of the verdict follows:

The jurors sworn to inquire when, how and by what means the above named deceased persons came to their death, upon their oaths, do say:

"That the said above named persons came to their death on the 11th day of July, 1912, in the Panama Coal Co. mine located just south of the city of Moundsville, W. Va., by an explosion of gas or firedamp existing in said mine, on account of the criminal negligence of the officials operating said Panama Mine not observing the laws of the State of West Virginia and the regulations and instructions of the Department of Mines regulating the mining business; the said officials being Willis Hupp, fireboss, and C. E. McCabe, mine foreman and superintendent."

Fireboss Hupp had been known to have been intoxicated several times while on the mine property, but not while on duty. It was also brought out that he did not have a certificate as fireboss, but was considered by Inspector Henry competent to detect gases and take the proper means to drive them out.

It seems to be the opinion of several that if the fireboss had made proper inspection, and the doors had been kept closed, there would have been no accumulation of explosive gas in No. 2 entry, and consequently no explosion. John Laing, chief mine inspector, claims the fan should run night and day, and when a foreman takes it upon himself to stop the fan, except for repairs, he is responsible for what may result. The fan at the Panama Mine had not been running the night before, and was started only at 7 o'clock in the morning.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Phenol as a Coal Solvent

In view of the fact that the Bureau of Mines has been making some investigations as to the value of phenol as a coal solvent, the following extracts from the Comptes Rendus de la Académie des Sciences,* Vol. 88, published in 1879 may be of interest. The author is M. E. Guignet and the experiments were made at the Ecole Polytechnic of Rio Janeiro.

It will be seen that these researches of M. Guignet are hardly up to modern standards, because he has made no chemical analysis of the coal, the extract or the residue obtained. He appears to have had more success in the removal of phenol from the extract by the use of alcohol, than was obtained by the Bureau of Mines when using sodium hydrate and hydrochloric acid. Alcohol has been found to have little solvent action on coal and consequently is not so readily suspected of modifying the conditions of extracted coal bodies.

*Translated for Coal Age by R. D. Hall.

Alcohol Removes The Phenol

"In treating the fatty coal with ether, benzine, bisulphide of carbon and above all with chloroform, several chemists have only succeeded in removing small quantities of bituminous matter. I have obtained better results with phenol (phenic acid). The coal reduced to a coarse powder was completely dried at 230 deg. F. and then passed through an extremely fine screen.

It was later heated to 212 deg. F. with phenol from which the water had been completely removed. The liquid turned to a markedly brown tint. It was filtered warm through a double filter of thoroughly dried paper. After cooling, a part of the brown matter was deposited, but in order to separate the phenol entirely, it was necessary to add ordinary alcohol to the solution. Abundant brown floccules were deposited and the liquid became absolutely clear.

On washing the brown matter on a small filter with alcohol, I removed every trace of phenol. The soluble part in the solution represented about two parts in 100 by weight of the coal from which it was obtained, but I was able to extract a great deal more by grinding the original sample to a much greater degree of fineness. The coal which had been passed through the extremely fine screen, always contained some angular fragments which were almost filiform.

In order to break up this powder which was always coarse and rough to the touch, I crushed it wet on a sheet of glass with the help of a corrugated roller. After some hours the coal became a clear brown and was soft to the touch. In this state it yielded to the phenol nearly four parts to every hundred of the original sample."

Byproduct Coke Ovens

The following is an abstract of W. E. Hartman's paper read before the Engineers' Society of Western Pennsylvania. Mr. Hartman represents the designers of the Koppers ovens.

The prime requisite when coking in byproduct ovens is the maintenance of a uniform heat throughout the length of the oven. Only this will produce a uniform product in a minimum length of time. The coking time cannot be reduced without limit because of the lack of refractoriness in the lining of the oven. If the coke is not uniformly heated, it is impossible to make any reduction in coking time because of the danger of over-coking or under-coking some of the charge, both of which faults are detrimental to the quality of the coke.

Some byproduct ovens will convert a ton of coal into coke every hour; whereas a beehive oven often does not turn more than one ton of coal into coke in eight hours. The cost of a byproduct oven is, however, about ten or fifteen times as great as that of a beehive oven, and the apparatus needed for treatment of the byproducts will duplicate the cost of the ovens. Speed in coking makes the coal more porous. Coal containing 30 per cent. of volatile matter has been coked in byproduct ovens.

The Expansion of Silica Brick

The blast furnace departments testify to the statement that coke made in 16 hr. is more porous, and yet has equal crushing strength with that made in 24 hr. The short-time coke is better suited for furnace use than the long-time product, provided the coking is even throughout. I believe that before long the time will be reduced to 12 hours.

Such shortened time as we have already secured is due to the introduction of silica material in oven construction, as much as 96 per cent. of the brick being SiO_2. The expansion of such brick is ⅛ in. to the foot. An oven battery 70 ft. long would expand 8¾ in. Some coke-oven experts expected that such a battery would be pushed off the foundations by this pronounced expansion, but the expected displacement did not occur.

Byproduct Ovens Increasing in Size

Another feature of note in byproduct coking is the increase in the size of the ovens. Those built at Joliet in 1907-1908 were designed with a capacity of 10½ tons per charge, and they were then considered large. The batteries of the same type built since this have been composed of ovens capable of holding 12¾ or 13¼ tons.

Our standard oven at this date receives 15 tons per charge. It would be folly, however, to try to make such decided increases in oven capacity unless the design of the oven provided for uniformity of coking throughout the length of the oven. This 15-ton oven referred to is 40 ft. long between doors, 11 ft. high and has an average width of 19 in.

First Cost and Life of Byproduct Coke Ovens

Whereas beehive ovens can be built for $700 to $800 per oven, including all machinery, a byproduct plant costs $12,000 to $18,000 per oven, of which cost the oven battery itself absorbs about half. Consequently it is not surprising that the first cost of the byproduct plant is discouraging.

But on further consideration we find that the beehive oven on which we are figuring receives a charge of perhaps six tons every 48 hr., while the uptodate byproduct coke oven cokes its charge of 15 tons in from 15 to 18 hr. With this size of byproduct oven and this coking time it has been found that its cost of construction is about the same, or a little less than the cost of the beehive oven, figured on the basis of coke production.

By this we mean that the cost of the byproduct oven battery, including all its machinery, piping, etc., but excluding that part of the plant for handling and recovering the byproducts, compares favorably with the total cost of a battery of beehive ovens, when figured per ton of coke produced.

Frequency of Repairs

We have batteries which have been in operation 10 years without any oven wall repairs. On the other hand, I saw a plant in England where it is necessary to rebuild the oven walls about every two years, due to the fact that the coal used is high in alkaline salts, which unite chemically with the silica of the brick. Some coals in this country would have the same effect, but most of our coals are low in alkaline salts, and we can figure on a reasonably long life for oven walls. The battery of silica material at Joilet has been in operation now for about 3½ years, and to all appearances it is good for at least 3½ years more without repairs.

Volatile Matter in Coal

Due to the Steel Corporation's experience with "low volatile" coal at Joilet, it has come to be generally believed that the best quality of blast furnace coke could only be made by using a low volatile coal or a mixture by which the same result was attained. The coal used at Joilet was for a long time 80 per cent Pocahontas and 20 per cent. Ronco, making the volatile content of the mixture about 20 per cent.

More recently Illinois coal was substituted for that of Ronco, and more recently still, the ovens had a month's run of 60 per cent. Pocahontas and 40 per cent. Klondike. This mixture had a volatile content of about 25 per cent., and it is interesting to note that this coal mixture produced coke far superior to that formerly made. The porosity was higher and the blast furnace results were decidedly improved.

There is a byproduct coke oven plant at Duluth, using in the ovens ¾-in. screenings from Pittsburgh coal. This has a volatile content of 34 or 35 per cent., and the coke gives good results in their blast furnaces, which are relatively small.

The Side Thrusts of Low Volatile Cokes

In Germany a large number of Koppers plans are operating with washed coal containing from 10 to 12 per cent. of moisture, and from 14 to 16 per cent. of volatile matter. It is not generally known that coal of this kind can be used without having trouble from expansion during coking.

The Koppers concern has no such difficulties, and attributes its success largely to the fact that the coking processes take place uniformly throughout the length of the oven, and thus no part is overcoked. This over-coking would result in excessive formation of breeze, which would interfere with the pushing of the charge.

The specific gravity of the coal has an important bearing on the subject. Several Koppers plants operating in England use light coal, and the volatile content is about 30 per cent. In order to make metallurgical coke from this light coal it is necessary to compress the fuel by stamping it into a cake before charging. In this country a number of plants are making good metallurgical coke from coal containing 30 per cent. of volatile matter, without any such troublesome treatment of the coal before charging.

Another important characteristic of coals is their oxygen content. A coal which is high in oxygen requires a relatively high temperature and longer time for coking, and gives trouble through an excessive formation of carbon in the oven and pipes. Also, the gas yield is lower, and the quality of the gas is poorer, so that all things considered, it has been found that high oxygen in coal is much more objectionable than high ash content.

Quenching and Screening of Coke

It is essential that the moisture content of the quenched coke should be low. In Europe I found that most of the plants were pushing their coke on a wide level wharf; here it was quenched with a hose and wheeled by barrows into railroad cars. It may be said that this method did not result in coke containing low percentages of moisture and it would be an expensive method of handling with our high cost of labor.

We have had the greatest success by pushing the coke directly from the ovens into a long open quenching car, preferably lined with cast iron. In such cases, the coke is quenched by a large overhead stream immediately after it falls into the car. It has been found, however, that quenching the coke opposite the ovens is open to objection, because of the large amount of steam produced, this steam having an injurious action on the oven steel and brickwork, as well as being disagreeable to the operators, so that now the tendency is to take this car away to be quenched at a station slightly removed from the battery.

It has been recently suggested that the quenching can be still more efficiently accomplished with lower resulting moisture if hot water is used and we are making experiments based on that suggestion. The necessity for further improvement in quenching methods is evident from the fact that one byproduct plant has recently contracted to sell a part of its output on a specification requiring that the moisture shall not exceed 1 per cent.

Small Coke Preferred

It has only recently been demonstrated that it is poor policy to use run-of-oven coke in blast furnaces. Plants are now being equipped with facilities for screening, and in some cases the product will also be crushed as well as screened. Various types of screens have been used, including straight bar, shaking bar and revolving screens. Of these the last is without doubt the most efficient.

A revolving screen not only separates the breeze thoroughly, but also breaks off any loose particles of coke which would otherwise become fines in the blast furnace or cupola. The Steel Corporation's coke plant at Joliet, and their blast furnaces have demonstrated to their satisfaction that it is exceedingly advantageous to use only thoroughly cleaned coke, reduced in size to 2 in. or less.

Byproduct and Surplus Gas

It has been predicted that with the increasing introduction of byproduct ovens, the market prices of tar and ammonium sulphate would be rapidly lowered. People have been prophesying this for the last 10 years, and yet prices for these products have been steadily increasing.

This is explained by the rapid development of the market, due to the increasing uses for these products. One of the recently developed fields for coke-oven tar is its use in Diesel engines. Prime movers of this type of a capacity of 5000 hp. and over are successfully using tar as a source of power. The only treatment the substance needs is one which will remove the water.

It has been found that the surplus gas can be used advantageously wherever gaseous fuel, either producer, blast-furnace or natural gas, has found application. In this connection we have recently introduced what are known as our "gas ovens" or "combination ovens." These have been adopted by a number of steel plants in Germany, the coke ovens being heated with blast-furnace gas and all the gas from the coal being used in the various departments of their steel plants.

It has also been used as an openhearth fuel. Germany has made more progress in this direction than this country, and has demonstrated clearly that coke-oven gas is well adapted for this purpose. A recent interesting contribution on this subject was published in *Stahl und Eisen*, Dec. 7, and 21, 1911, and translated in the *Iron Age*, Feb. 8, 1912.

Increased Size of Modern Ovens

F. F. Marquand* sent the following communication:

The statement Mr. Hartman makes regarding the rapid evolution of byproduct coke-oven construction is not in the least exaggerated. Ten years ago when the

*Superintendent coke works department, South Sharon steel works, Carnegie Steel Co., South Sharon, Penn.

United States Coke & Gas Co. built our plant of 212 Otto-Hoffman ovens at South Sharon, we had the largest byproduct ovens built up to that time, 42 ft. long, 17½ in. wide and 7 ft. high, taking a charge of 9.12 net tons of coal.

The ovens were operated with considerable difficulty at first, and for a time it was feared that the plant was a failure because of the excessive size and difficulty of heat control. However, many details have been worked out which have put us on an efficient and profitable operating basis, and today, instead of the ovens being too large to compete efficiently in the coke making of the Steel Corporation, they are now too small.

Joliet has exceeded us in size of oven and Gary has exceeded Joliet in about the same proportion. Today we are operating our ovens on a mixture of 65 per cent. of Klondike and 35 per cent. of Pocahontas coal, the mixture having an average of 25.5 per cent. of volatile matter.

We have steadily maintained a coking time of 24 hr., but within the past month we have reduced the coking period to 20½ hr. with encouraging results. Our blast furnaces, which are operating entirely on Sharon byproduct coke, responded immediately by increasing iron yield and by working more smoothly. The coke is slightly larger, more porous and tougher.

Faults in Coke Chargeable to Coal

It is folly to compare byproduct coke made from an inferior coal with beehive coke made from the best Connellsville fuel, but this is often done. The byproduct coke of today, where it is made for metallurgical fuel, is far superior to that made 10 years ago; first, because the coal for making this coke has been thoroughly studied, and second, the heat is much higher and more uniform.

The oxygen in coal has a most deleterious effect on the quality of coke; for this reason coals which have been subjected to weathering, such as coal left on stockpiles, even for as short a period as four or five weeks, is pronouncedly inferior in quality of both gas and coke produced. The shorter the interval of time from the mines to the ovens, the better the coking results will be.

Results from Reduction of Coking Time

In the reduction of our coking time from 24 to 20½ hr., I have observed that we got a quality of product which enabled the blast furnaces to work more rapidly and more smoothly. However, hastening the coking process has a tendency to increase the amount of coke used per ton of iron produced. This, however, on so small a period of time as our experience covers is not conclusive evidence. I also found that our tar yield was reduced from 7 gal. per net ton of coal to 5¾ gal., and we had an increased amount of napthalene with which to contend.

Our ammonia yield decreased from 4.75 lb. NH_3 per net ton of coal to 4.4 lb. Our surplus gas yield increased from 3000 cu.ft. per net ton of coal to 4600 cu.ft. Our total gas was about the same, 12,000 cu.ft. per net ton. Thus, it took no more gas per hour to heat the ovens when the coking time was 20½ hr. than it took when the coking was completed in 24 hr. However, the higher heated walls enabled us to burn this quantity of gas more efficiently in the oven flues.

Does Not Pay to Speed Coking Unduly

I believe our yields of tar, ammonia and gas will be proportionately affected as the coking time is reduced still further, so that a time will doubtless be reached when the heat necessary to produce a shorter coking time will affect, on the whole, a loss rather than a gain when all factors are accounted for.

The result of our practice shows that we get a yield of 76 per cent. dry furnace coke and 3 per cent. dry breeze from a coal mixture having 25.5 per cent. of the volatile matter which shows that 4.5 per cent. of the volatile matter driven off in the laboratory test is converted into coke in the byproduct oven, while, on the other hand, in the beehive ovens the coke yield is 3 to 6 per cent. less than the results as shown by laboratory analysis of the coals carbonized; this makes a saving in the coke yield from byproduct ovens of from 7 to 10 per cent. more than the coke yield from beehive ovens coking from the same coal.

Richard Moldenke* discussed the paper as follows:

The Foundryman Would Lengthen Coking Time

The foundryman will take exception to some of the statements of Mr. Hartman. It is true that shortening the coking time increases the porosity of the coke, but it may well be discussed whether it does not also decrease its crushing strength. The furnaceman wants to see the porosity increased as he wishes to make as much carbon monoxide as possible in his furnace.

But the foundryman wants a coke with a minimum cell space. He seeks not partial but complete combustion of the carbon. Hence the foundry trade, with an annual consumption of possibly a million and a quarter tons of coke will not welcome a reduction of coking time in either the byproduct or the beehive oven.

I agree with Mr. Hartman that the way to get greater percentages of cell space is by the use of higher temperatures. This is true of other makes of ovens besides his own. It is true of the beehive oven where the admission of more or less draft through the door hastens or retards the making of cells in the coke. It is well known that the cell structure of coke is developed in the first 24 hr. after the coal is put in the ovens.

*Secretary American Foundrymen's Association.

Permissible Variations in Volatile Matter

Mr. Hartman is in error when he states it as generally believed that the Steel Corporation's experience with low volatile coals indicated that the best cokes were made that way. Quite the contrary, for it was generally thought that much of the trouble known to exist at the Joilet plant was due to the comparatively low percentages of volatile matter present in the coals used. Mr. Hartman practically admits this, when he states that better results were obtained with the mixtures of coal containing 25 per cent. of volatile matter.

As a matter of fact, every byproduct plant has its own experience and consequently a different standard for volatile matter. At one plant 20 per cent. is preferred, another wants 25 per cent. and still another 30 per cent.

The Waste-heat Oven for Independent Coke Producers

W. O. White* communicated the following:

There is no question but what adequate return will be realized on the investment required for the erection of an uptodate byproduct coke plant when erected in connection with a large steel mill. Viewing the situation from the standpoint of the individual or corporation which intends to operate a large tract of coking coal as a coke operation pure and simple, then the question which presents itself to me is this: Will the return on the investment warrant byproduct coke-oven construction?

My opinion is that the smoke which now goes to waste and kills the vegetation in the country surrounding our coke ovens can be more profitably used in a regenerative type of retort than in a byproduct oven. A plant constructed along this line would be one in which the coking period would be greatly shortened, where also there would be a considerable excess of heat which could in many localities be converted into electrical power at a comparatively small additional cost of investment.

Growing Byproduct Market

E. W. Parker† contributed the following information:

As Mr. Hartman justly states, the development of the byproduct or retort method of coke making in the United

*Civil and Mining Engineer, Uniontown, Penn.

†Statistician U. S. Geological Survey, Washington, D. C.

States has been retarded, first, by the high cost of installation, and second by the apprehension on the part of the by-product oven installers themselves that the markets for the byproducts, with the exception of gas, would soon be demoralized by excessive production. This was principally feared in regard to tar.

There was, 15 to 20 years ago, no briquetting industry in the United States, though some sporadic attempts had been made to establish plants for the briquetting of anthracite dust. There was no demand for creosoting oils, for we were so sure that we had an inexhaustible supply of timber suitable for ties and for bridge trusses. There was no chemical industry dependent upon coal tar as a raw material and such an industry is still sadly wanting, the United States being far behind Germany in the utilization of coal-tar products.

There is now a large and growing demand for creosoting oils, the principal complaint being that the distillers of coal tar are not alive to the exact requirements of the creosote users and do not exercise the care necessary to produce the grade of creosoting oil required, and this fact prevents development.

In a like manner there is not the exactness maintained in the manufacture of coal-tar pitch which is demanded by the users of briquet machines, and that industry is somewhat halted on that account. The principal demand heretofore in this country has been for roofing papers and other materials of this kind, and the coal-tar distillers have catered for this market principally. With an ample supply of raw materials in sight the industries dependent upon them will develop and the demand increase.

Prejudice Against Byproduct Coke Disappearing

The prejudice against byproduct coke, which was much in evidence 12 or 15 years ago, is disappearing. Iron masters accustomed to the beautiful silver luster of Connellsville coke concluded that any other coke, not having such luster was of inferior quality, and it was immediately condemned. There was no thought of making a change in the blast furnace charge or other conditions to meet the new fuel, and if the byproduct coke did not behave in the furnace in exactly the same way, as Connellsville coke the wisdom of the condemnation was proved.

The first plant of Semet-Solvay ovens, at Syracuse, N. Y., which was the first bank of byproduct ovens to be constructed in the United States, has been twice enlarged. Another instance is the installation of Koppers ovens at Las Esperanzas, Mexico. These are waste-heat and not byproduct-recovery ovens. The company secures from 50 ovens practically all the power necessary for the operation of its plant. It has increased its yield of coke from 15 to 16 per cent. and coke equally valuable with that made in 48 hr. in a beehive oven is produced in from 18 to 20 hr. A better price is obtained for the retort-oven coke than was obtained for the beehive product formerly made.

(*These remarks conclude the discussion by correspondence. In our next issue, the verbal discussion will be given at some length*—Editor.)

The Largest Electric Mine Hoist

The largest electric mine hoist in America is to be installed in the mine of the Christopher Coal Co., recently opened at Christopher, Franklin County, Ill. The mine is to be operated entirely by electric power and will undoubtedly be one of the most modernly equipped in this country. Power for the several operations will be generated at the mine by two 750-kw., 3-phase, 60-cycle, 2300-volt Curtis turbo-generators, for which excitation will be furnished by a 15-kw., 125-volt turbo-exciter set.

Above ground practically all the machinery, except the hoist, will be operated by alternating current; while all the underground equipment is to be operated by 250- to 275-volt, direct current, which will be supplied by three 300-kw. synchronous motor-generator sets, each composed of a 430-kv.-a., 2300-volt synchronous motor, a 300-kw., 275-volt, compound-wound, direct-current generator and a 7.5-kw. 125-volt, direct-connected exciter. These units have extra capacity to furnish approximately 700 wattless kilovolt-amperes, and will be made use of when it is desired to bring the power factor nearly to unity.

The hoist is to be made by the Ottumwa Iron Works and will require half the capacity of the plant. It will operate on the Ilgner system and is of the double-drum type, having 7-ft. drums designed for an effective load of 9000 lb. in a car and cage, the combined weight of which is 11,000 lb. Wire hoisting rope 1⅜ in. diameter is used. The equipment is being built to make 1000 trips from a 600-ft. depth in seven hours. The proposed cycle calls for 6 sec. acceleration, 9 sec. at full speed, 6 sec. for retardation and 4 sec. loading and dumping, which corresponds to a maximum rope speed of 2400 ft. per minute.

A 1150-hp., 550-volt, direct-current motor drives the hoist and is direct connected to the drum shaft by a flexible coupling. This motor is designed especially for hoisting service and has large overload capacity. Power will be supplied to the motor by a flywheel motor-generator set, consisting of a 650-hp., 2300-volt induction motor, a 880-kw., 550-volt generator, a 17-kw., 125-volt exciter, and a 22,600-lb. flywheel. This unit operates at 600 r.p.m. It is interesting to note that, through the Leonard method of control and the application of the flywheel, it has been possible to decrease the capacities of the hoist motor, generator and induction motor progressively, contrary to usual practice.

The speed and direction of rotation of the hoist will be controlled by a controller at the operating platform, by means of which the voltage and polarity of the generator will be governed. The efficiency of this form of control, called the Leonard control after its inventor, H. Ward Leonard, is very high, as there are no rheostatic losses except the comparatively small ones in the field circuit of the generator. Fluctuations of the hoisting load are smoothed out by means of the flywheel and an automatic rheostat in the circuits of the induction motor.

The torque of the regulating motor varies with the line current, and when this current tends to exceed a predetermined value, the torque of the regulating motor will overcome the weight of the moving parts of the rheostat, introducing resistance into the rotor circuits of the main induction motor, thereby causing the motor to slow down and allowing the flywheel to give up its energy. When the current tends to fall below this predetermined value, the weight of the moving parts of the rheostat will exceed the torque of the motor and the resistance will be cut out automatically. The weight of the moving parts of the rheostat is counterweighted for purposes of adjustment. In the control equipment are also included protective devices to guard against damage from overwinding, failure of alternating-current supply, loss of exciter voltage, loss of air pressure for the brakes, as well as extreme overloads. Both service and emergency air brakes are provided.

No mules are to be used in this mine, but thirty-two 6-ton electric mine locomotives, having a rating of 3000 lb. drawbar pull at six miles an hour, are included in the installation. A number of these locomotives are arranged for tandem operation, so that in case of breakdown substitutions can be made. All tandem locomotives can be used either as 6-ton gathering locomotives or 12-ton main-line haulage locomotives.

A 250-hp., variable-speed induction motor will drive the ventilating fan and several small induction motors, ranging from 10 to 50 hp., will be installed for operating the conveyors, shaker screens, picking tables, pumps, etc. The current for these latter motors and the air-compressor motor will be reduced by three 50-kv.-a. transformers from 2300 to 220 volts.

The equipment is completed by an 18-panel switchboard of dull-black slate, 26 ft. long, for controlling all the electrical apparatus. The board will be fitted with all the necessary instruments, totalizing wattmeters being provided to record the total amount of energy delivered from the power station.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

There are four divisions included in the organization of the U. S. Bureau of Mines. These departments are known as (1) administrative, (2) mechanical engineering, (3) chemistry, and (4) mine engineering. George S. Rice, as chief of the latter division, is in close touch with all the technical coal-mining problems which are being investigated by our Government engineers. Since January of the present year, all rescue work has been brought under the direct charge of the chief of the mining division. Mr. Rice also directs the investigations in Alaska, as well as the coöperative work which the Federal Bureau is carrying on in conjunction with the State of Illinois.

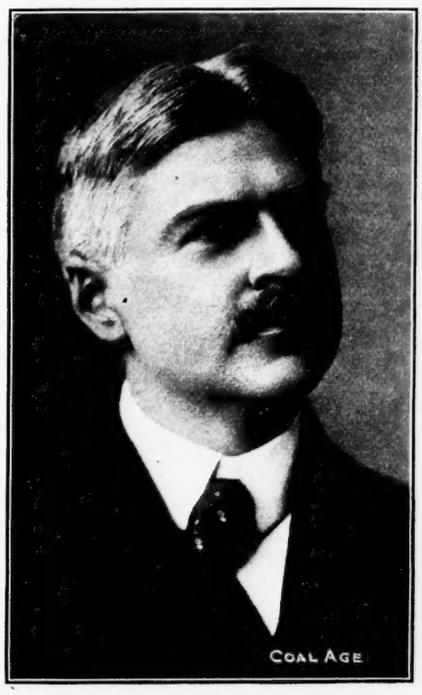
Mr. Rice was born at Claremont, N. H., Sept. 8, 1866. His early life was spent in New York City and Tarrytown, N. Y. After several years training in the public schools and further preparation at the College of the City of New York, he entered Columbia University, graduating from that institution as a mining engineer in 1887.

Immediately after finishing his university work, Mr. Rice went to the Rocky Mountains and was engaged on a railroad survey in Coal Basin, Colorado. Subsequently, he became attached to the engineering staff of the Colorado Fuel Co., later a part of the Colorado Fuel & Iron Co., assisting in the engineering work incident to the opening up and development of some of the early coal mines at Sopris, and Rouse, Colorado.

In 1891 he became mining engineer of the Whitebreast Fuel Co. of Illinois and Iowa, which concern at that time furnished most of the coal for the Burlington Railroad. A little later Mr. Rice was appointed chief engineer and was principally engaged in opening out the Ladd and Dunfermline mine No. 2 in Illinois, and the Pekay and Cleveland No. 4 mine in Iowa.

One of the interesting pieces of work carried on by the Whitebreast Company at this time was the introduction of the longwall system of mining in Iowa at the Forbush mine. Afterward, many of the mines of the Appanoose County field adopted the same system of working. His headquarters during this period were at Ottumwa, Iowa. On Dec. 23, 1891 Mr. Rice was married to Miss Julia Sessions of Schoolcraft, Mich. This union resulted in three children, two of whom are living, a boy and a girl both in high school.

In 1897 the company moved Mr. Rice's headquarters to Chicago, where subsequently he became consulting engineer for the same people. Thereafter, a considerable part of his time was occupied in general engineering practice in various kinds of mining besides coal. Much of his work was coal prospecting for such men as J. C. Osgood, G. W. Traer, E. T. Bent and others.



GEORGE S. RICE

The Cardiff mine and the Panama mine, both in Illinois, were opened up under his supervision, and were among the earliest of the modern-plant installations in the middle west. Subsequently, in conjunction with Andrews Allen, then of the Wisconsin Bridge Co., he designed a standard type of steel tipple, which has been extensively used in the interior coal field. To take care of the changing conditions on account of the short life of Iowa coal mines, Mr. Rice introduced the scheme of using field bolts in erecting steel tipples. This plan was followed first at the Hilton mine in Iowa, the expectation being that the tipple would outlast the mine and could be removed to another site.

As a result of difficulties experienced by the Whitebreast Fuel Co. in sinking shafts through quicksand, he designed a system of steel trussing and introduced the use of angle-iron hangers for wood curbing, for the purpose of combining a movable steel shoe with a drop shaft. This plan overcame the trouble experienced in holding a wood crib bed shaft together while going through alternate quicksands and hard strata such as occur in the deep glacial deposits of the northern Illinois field.

During this period of his engineering work, George Rice served in the capacity of consulting engineer for a number of large companies, including the St. Paul Co., Granville, Ill., the Chicago & Carterville Coal Co., near Herrin, Ill., the Atchison, Topeka & Santa Fé Railroad and the Raton Coal & Coke Co., which latter concern now belongs to the St. Louis, Rocky Mountain & Pacific Railroad. He was laso interested in the development of lead and zinc in Wisconsin, and in the Joplin district of Missouri. Some experience also was had in the examination, purchase and development of phosphate properties in Florida and Tennessee. During this period from 1899 to 1908, Mr. Rice acted as general superintendent of the Cardiff Coal Co. and the Panama Coal Company in Illinois.

In 1908 Congress made an appropriation for the investigation of mine explosions and accidents, to be used under the jurisdiction of the Technologic Branch of the U. S. Geol. Sur. This branch subsequently became the Bureau of Mines, and Dr. Holmes who was appointed chief of the Bureau, called Mr. Rice to Washington and proposed that he start this governmental mine investigation work. Although "G. R." felt that to connect himself with this new Bureau meant a complete change of life, he considered that the problems presented were so attractive that he could not refuse the offer made to him by Dr. Holmes. Six days later, after having hurriedly settled his affairs in Illinois, Mr. Rice sailed from New York on a trip across the Atlantic to investigate European mines.

On his return from abroad in 1908, the explosion at the Marianna mine in Pennsylvania called for investigation. This accident, as well as most of the subsequent explosions occurring in this country, was investigated by Mr. Rice in conjunction with other engineers of the Bureau. It is expected that *in the course of time* the reports of these various investigations will be made public and be useful for the student of mine explosions.

In 1910 Mr. Rice was actively engaged in opening up the experimental mine near Bruceton, Penn. In 1911, he headed a party of American coal-mining engineers on another foreign trip, designed for the study of European mining methods, par-

ticularly the various systems of flushing in use by foreign companies. The report of this trip is *about to be printed,* and one particular point which will be brought out is the immense advantage that Continental companies possess in being able to obtain large profits from their mining operations. This enables them to adopt safety methods without regard to cost.

Last fall (1911) Mr. Rice served on a commission of international membership, which was appointed to investigate the danger that was alleged to exist from the repetition of the slide of 1903 at Frank, B. C., supposed to result from mining at the base of the mountain.

George Rice has been the author of many papers, too numerous to mention. He is a member of many mining societies, among which are the American Institute of Mining Engineers, Mining & Metallurgical Society of American, Western Society of Engineers, North Staffordshire Institute of Metallurgical Engineers (England), American Association for the Advancement of Science, Coal Mining Institute of America, West Virginia Coal Mining Institute, and the Mine Inspectors Institute of the U. S. A. He also belongs to the Cosmos Club, Washington, D. C., the Engineers Club in Chicago and the Edgeworth Club, Sewickley, Penn.

Sincerity is to speak as you think, to do as you pretend, and to make good what you promise. George S. Rice is the embodiment of this quality. He is quick to give himself for a principle, and his earnestness of belief gives a personal impact to all his opinions. There is authority in his very enthusiasm, aside from his intellectual equipment. So long as such men direct the activities of the U. S. Bureau of Mines, the work of this governmental department will be valued and respected by all those engaged in mining coal.

The Caledonia Tipple

A four-track steel tipple, which might be said to be unique in construction, because of many new features in its make-up, and because of its unusual general arrangement, has recently been designed by the Roberts & Schaefer Co., of Chicago, for the Rainbow Mine of the Monon Coal Co., near Caledonia, Sullivan County, Indiana. As a matter of fact the special construction involved might easily gain for it the name of a freak tipple, since it is entirely different from any tipple in the states of Indiana and Illinois, with respect to the arrangement of the weigh hopper, shaker screens and picking tables.

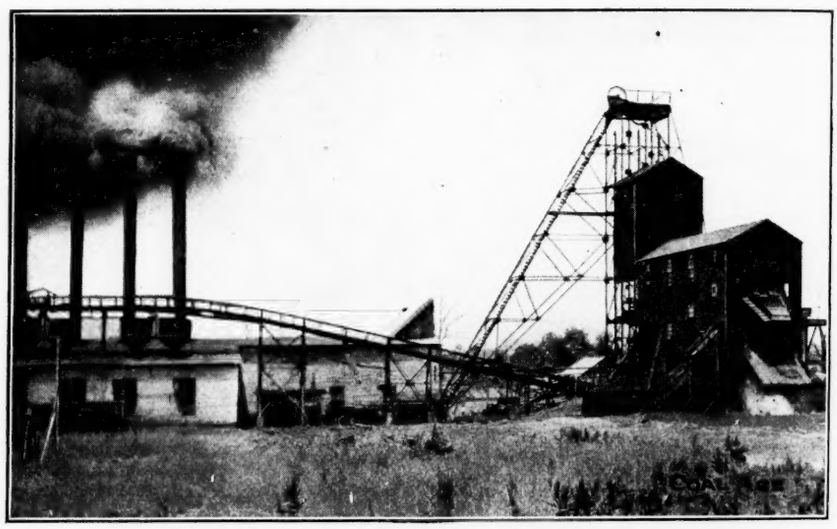
Probably a clearer idea of the arrangement may be obtained by studying the progress of the coal through the tipple.

Standard self-dumping cars are used, which discharge into standard Indiana bar screens. The lump coal passes into the weigh hopper, and a fixed hopper below the bar screen gathers the slack and delivers the same into an auxiliary hopper which feeds the picking table. The lump coal after it has been weighed in the weigh hopper is deposited in the fixed hopper, on top of the slack coal, which is dropped through the bar screens. This slack coal therefore serves as a cushion for the lump coal and prevents breakage. The slack coal and the lump coal, or run-of-mine, is then fed by a feeder, below the auxiliary hopper, into the picking table, and the lump, being on top of the slack, can be very easily picked.

In designing the picking table, it was necessary to so arrange it as to enable the operator to pick the coal more carefully and economically than is done by the usual method. The table is divided into four compartments. The two outside compartments are for coal, one of the center compartments for sulphur balls, and the other center compartment for rock and slate. There is a walk on either side of the table for the pickers, who handle the coal as it travels towards the shaker screens, removing the slate, bone and other impurites, which are thrown into the compartment for this material, and from which it is discharged at the end of the picking table into a car set for the purpose near the tipple. The pickers also remove the sulphur from the coal and deliver it to its separate compartment which in turn delivers it to a special car at the end of the table. The sulphur, being in the form of pyrite, is sold to manufacturers of sulphuric acid, and, at times, they pay enough for it to reimburse the mining company for the cost of picking the coal. This adds considerably to the improvement of the coal, since much better results are obtained by the use of the picking table than by the old method of picking on top of the car. The coal from the two compartments of the picking table is discharged on to a chute, which delivers the coal into the shaker screens, and on which the coal is sized into four standard Indiana sizes.

Arrangement is also made for the removal of the coal direct from the fixed hopper under the weigh-basket without running the picking table, and, in this way, mine-run coal is delivered by chute into cars on the first track adjoining the shaft. In other words, the location of track differs from the usual arrangement of tracks at tipples. The track nearest the shaft is the lump-track, whereas, in usual cases, it is the screenings-track, and the outside track, or track farthest away from the shaft, is in this case the screenings-track, whereas, in the usual practice, it is the lump-track.

When it is desired to load picked run-of-mine coal, a by-pass chute at the head of the picking table permits of the loading of picked run-of-mine coal on the outside or screening track without running the shaker screen. Provision is also made at this plant for loading local-trade coal and also to provide screenings for boiler purposes.



THE NEW TIPPLE, RAINBOW MINE OF MONON COAL CO., CALEDONIA, INDIANA

This arrangement of tipple therefore allows for the production of any of the following grades of coal; mine-run, not picked; mine-run, picked; bar-screened lump, for local trade; picked and screened coal divided into screenings; nut, egg and lump, or any combination of these sizes that may be desired. Whatever quantity of screenings may be demanded can be readily taken from the fixed hopper, whether the coal is or is not being picked.

When firedamp is encountered with a safety lamp, do not throw away the lamp or blow it out, but hold it near the floor in a sheltered position, and carry it steadily to the fresh air. If the gas fires in the lamp lower cautiously, and smother the flame.

Issued Weekly by the
Hill Publishing Company
JOHN A. HILL, Pres. ROB'T MCKEAN, Sec'y.
505 Pearl Street, New York.

Monadnock Bldg., Chicago.
6 Bouverie Street, London, E. C.
Unter den Linden 71—Berlin. N. W. 7.

FLOYD W. PARSONS, Editor.

Correspondence suitable for the columns of COAL AGE solicited and paid for. Name and address of correspondents must be given—not necessarily for publication.

Subscription price $3 per year in advance for 52 numbers to any post office in the United States or possessions, and Mexico. $4 to Canada. $5 to any other foreign country.

Subscribers in Great Britain, Europe and the British Colonies in the Eastern Hemisphere may send their subscriptions to the London office. Price 21 shillings.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday of week prior to date of issue.

Entered as second-class matter, October 14, 1911, at the post office at New York, New York, under the act of March 3, 1879.

Cable Address, "Coage," N. Y.

CIRCULATION STATEMENT.

Of this issue of Coal Age, we will print 8250 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

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COAL AGE

A Laggard Industry

Almost all the new improvements in mining in America have come from outside and have been resisted by the operator, the final consent to development being merely a succumbing to the pressure of the persistent salesman. In many cases more competent engineers have been found in the offices of the machinery concerns than were engaged by the largest coal companies.

And now the byproduct coke oven is being introduced, not as an outcome of the enterprise of the coal operator; it owes its American *début* to the steel corporations. In fact today we owe many of our revolutionary systems in mining to the managers of coal plants owned by the steel interests.

Why the coal corporations do not lead in such developments is not difficult to explain. We have all observed the leading man in some remote agricultural district neglecting his farms and allowing his stock to deteriorate, and have soon learned he was "land poor." He was too poor to make generously productive what he already possessed.

And this is the condition of the coal companies. They lag because there is not the money to lead; they waste because they have not the little capital needed for conservation. They dread changes because they may wipe out the little margin of available cash at the bank.

The public needs that the industry be conducted free from the hamperings of poverty. The living wage is necessary, not only for the worker, but the operator, so that he may be enabled, like the workingman who is well fed and clothed, to do a good day's work. The public does not know, and can never estimate, what the coal industry might have been, had it been free of money cares and the specter of never-ending losses.

No coal operator dare scheme or start any new comprehensive method or plan, and the only real advancing section is to be found in those districts where a monopoly, natural or artificial, has begotten confidence and awakened inventive ability. For most mining engineers, the utmost intelligent effort permitted is a reuse along new lines of material already on hand, and their activities are halted if the new practice or appliance would add a single half cent to the cost of the next fortnight's coal.

Phenol as a Coal Solvent

The chemical compositions of all the coal solvents are such that it is extremely hard to tell the true nature of the body extracted from the coal. It may be a substance originally existent in the sample, or perhaps it is an agglomerate of compounds of the original coal or of the extracted body, with the elements contained in the solvent. Or again, it may be merely a mixture of the dissolving substance with the extract, or an aggregate of all three types of bodies. All experimental work must be done with extreme care, not for the purpose of preventing such actions, for they cannot be prevented, but to detect the possible reaction, should it take place.

When a lignite analysis is redetermined on an ash- and moisture-free basis, and the nitrogen is disregarded, it will be found that the composition of the fuel closely resembles that of phenol. That carbohydrate has 1⅓ times the hydrogen and about 1¾ times as much oxygen as the coal from Ziegler, Ill., chosen by the Bureau of Mines as the type for investigation in its researches into the solubility of bodies in the coal substance. It is, therefore, possible for phenol to hide away in extract and residue and not to show its presence clearly, because what dissolves and what remains are likely to have different proportions of oxygen and hydrogen to that of the original sample.

Pyridine could be detected more easily because it has 8.4 times as much nitrogen as the coal to which we have referred. It is a trifle richer in nitrogen than phenol is in oxygen, so the ques-

tion whether it has either combined integrally or has not been thoroughly washed out of residue or extract is more certainly proved than is the case with phenol.

Another matter which must always be remembered, is that coal and the extract, whether mere solutions or derivatives of coal, are subject to oxidation and any awkward handling may cause the birth of new compounds and make identification of the original substance impossible.

We must confess that it was with a great sense of disappointment that we perused technical paper No. 5, entitled "The Constituents of Coal Soluble in Phenol," and this disappointment did not arise from the fact that Frazer & Hoffman came to no broad conclusions, because hardly any hope could be held out that they would do so at so early a stage.

The final paragraph of their report labeled invitingly "Conclusions," should be recaptioned "Concluding Remarks." It contains no general statement of results, but sets forth categorically: The explanation of a chart, an assumption which might have been tested and was not, a declaration that an investigation of larger quantities of coal might furnish more exact information and a note to the public that the experiments were to be extended with pyridine as the solvent in place of phenol. These are not conclusions, they are such material as might well be put in a preface.

We must thank the authors for being conservative, for failing to draw hasty conclusions and for replacing them by mere concluding remarks, but we cannot congratulate them on their having followed scientific methods. They could not fail to be aware that they were dealing with an unknown quantity when experimenting with coal and they could not but know that solvents were not always simple dissolving bodies.

But the authors of the paper exercise no such calculating caution. They weighed and analyzed the coal and the extract, but they did not weigh or analyze the residue or the wash water with its phenol, common salt and other impurities. We cannot see how it is possible to tell just what occurred. It is a hopeless piece of chemical arithmetic, a single equation with three unknowns.

We do not know even if the residue and extract added together will give us the whole amount of the original sample. Still, in view of experiences with pyridine, it does seem strange that the experimenters did not guard themselves against false conclusions by making some test of this kind. It is true that no absolute results could have been obtained, but certain arguments which now seem plausible might have been shown impossible by the added light which completer results would have cast on the action of the phenol.

Of course, if the extract was purely a solution, which the authors assume "in the lack of evidence to the contrary," well and good, but they did not seek for such evidence, as far as we can find out, and so the remark is merely the expression of a pious opinion.

When one extract was obtained in a flask, as a result of two filterings, in which it must have had access to air, the chemists desired to remove it; but it was congealed, owing to the hardening of the phenol, as the temperature was reduced below 95 deg. F. So they added sodium hydrate to it. Now that salt acts on coal freely, and coal which will coke well ceases to have that power so well developed after sodium hydrate is permitted to attack it, its use seems calculated to vitiate results. After trituration, the liquid was treated with hydrochloric acid sufficiently to remove its alkalinity. It was then filtered and washed and the weight of the extract determined.

Out of this distillation, aëration, reaction and washing came a queer substance containing 2.16 per cent. of ash, a derivative rather than an extract of coal. What was that ash which was soluble in phenol either in combination with other bodies or alone? It seems strange that it was not examined. Was it really derived from coal or from the hydroxide of soda, which probably combined with the extract, saponifying it?

And how was that ash determined? Were the cited elements, carbon, oxygen, hydrogen and nitrogen, evaluated and the balance dubbed without analysis "ash." If so, "ash" may be chlorine as well as soda, for the affinity of coal for chlorine has been shown by Smythe, who boiled powdered coal with hydrochloric acid for several hours, adding an oxidizer and chlorinizer, potassium chlorate, meanwhile. He found a coal extract which had absorbed more than 30 per cent. of chlorine.

So far as we know, no recorded experiments have been made with hydrochloric acid alone to determine its action on the coal body, but it is possibly not without effect on the coal, even in such short time, and at such temperatures as obtained in this experiment. Many conjectures can well be made, and Fraser and Hoffman probably expected that all the sodium would react with the acid to form common salt, and that its removal would be effectually assured through the washing which followed. They knew, however, that some yet appeared in the wash waters, so that it would have been better to have proved rather than assumed, that the chlorine remaining was in small quantity. Perhaps, like careful experimenters, they did make this test, but prudent monographers would have recorded the results.

Would it not have been better to have avoided these uncertainties, and to have tried heating the phenol and its included extracts to liquidity (95 deg. F.)? The phenol might then have been washed away. If not, the authors might have used alcohol, as did Guignet, with marked success. The extract had already been heated to 284 deg. F. or thereabout, and all the most volatile matters must have been already distilled.

It is inexcusible to use a solvent, or rather a reagent, like sodium hydrate, before the phenol is extracted, in view of the fact that its properties are so well known that it is used afterward by the same experimenters to separate the phenol extract into two parts, that on which sodium hydrate will act and that on which that salt will not act.

If these chemists, who entered on the labors of Guignet, had done one-eighth part of the work they accomplished and had done it with exactitude, something might have resulted. The exclusion of factors of uncertainty should be removed if any conclusions are to be drawn, and a mass of loose work, which does not assure results, is of no real value.

We are led to wonder what was the real purpose of the inquiry: To find out what was in coal, or to discover a derivative body, perhaps to use such a new coal-tar product as a stepping stone to commercial success. Why not? There is profit to be made in the fractionization of natural gas and an American might well turn coal-tar products into hard cash, as Perkins did aniline purple and mauve.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Prevention of Mine Accidents

At the first mine-foremen's examination I ever attended, one of the questions asked me personally was, "What is the first thing you would do if an explosion occurred in a mine of which you had charge?" This question calls to mind the old adage: "An ounce of prevention is worth a pound of cure." I am an advocate of *prevention*, in respect to mine explosions, believing that it is better to give more attention to those matters and conditions that will reduce the liability to explosion, than to spend so much time in considering what is best to be done in case an explosion should occur in a mine.

There are three features that are directly concerned in considering the security of a mine from explosion, namely: (1) The explosives used in blasting the coal. (2) The ventilation of the mine. (3) The machinery or methods used for mining the coal.

An experience of thirty-three years convinces me that most of the deplorable mine accidents can be traced directly, or indirectly, to one of these three causes. The excessive use of black powder in blasting coal has been the cause, perhaps, of a larger number of mine accidents than can be attributed to any one other cause, unless it be the failure to properly timber the roof and the coal.

Much has been said, of late, about permissible powders for blasting coal. In common with many other experienced miners, I prefer black powder in blasting coal. There is no explosive that breaks the coal in as satisfactorily a manner as does black powder. Its action in breaking the coal is more gradual, and it gives larger coal with less fine coal and slack when properly used. As the explosion of black powder is not as sudden, it wedges the coal from the roof or bottom where it is inclined to stick. This, I think, greatly relieves the roof from the tremendous strain and concussion to which it is subjected when any of the higher explosives are used.

It is claimed that the work done at the Pittsburgh testing plant, has shown that the intelligent use of permissible explosives, together with suitable electric detonators would do much to improve underground working conditions and to reduce the number of fatal and non-fatal accidents. The cost per ton of coal produced would be but little higher than when black powder is used and the quality would be equally as good.

It may happen that the use of a permissible explosive in a gassy mine will have a tendency to make some men careless in regard to the gas. If a small amount of gas has accumulated in a place where a shot is fired with black powder, the flame of the blast burns out this gas without doing any damage, more than to cause a possible windy shot. With the use of permissible explosives it might be possible that a larger quantity of gas would accumulate and become dangerous. Of course, with proper care this could not happen; but the possibility of such a result makes me feel that black powder is much the safer of the two classes of explosives in the hands of an inexperienced workman.

L. F. HESS.

Ansted, W. Va.

Mule versus Electric Mine Haulage

The uncertainty as to what the mine mule will do makes it desirable to replace mule haulage with some form of mechanical haulage as early in the development of the mine as possible. There are two general classes of mechanical haulage; namely, rope haulage and locomotive haulage. There are three kinds of locomotive haulage, steam, compressed air and electric haulage, the last two being most commonly used, in mines.

The special advantages of locomotive haulage are, (1) Power to haul large loads; (2) Speed; (3) Ability to work in low coal where a mule could not enter; (4) No limit to hours of work; (5) The expense of oiling and keeping up a locomotive is less than that of feeding a mule.

While there are some conditions, we must admit, where it is desirable to use mules instead of any form of motor haulage, there are many mines that have given up the use of mules even on their gathering hauls. As an illustration of this I would refer to a pick mine here started a year ago which now has three gathering motors of four tons each, 3½-ft. gage, handling a daily output of 700 tons. The mine employs 150 men. This to my mind, answers the question can a mine be run without mules; although I admit there may be conditions that require their use. JOHN SUTTON.

West Terre Haute, Ind.

Examining a Mine for Gas

As fireboss, I am always interested in the question of mine gases and their detection. As secretary of our mining institute, the question was recently asked me, How is a fireboss to detect the presence of carbon monoxide (CO), in a mine? I regard this as a most serious question, as it takes but a small amount of this gas to cause death. It is the most dangerous gas that we must contend with in the mine. In answer to the question I would refer to the article entitled, "Detection of Carbon Monoxide Gas in Mines," COAL AGE, April 27, 1912, p. 953. This article explains that it is unsafe to rely on the indications given by the lamp flame, for this gas; but other means must be used for its detection, such as carrying caged mice or birds; or the blood test must be used. The blood test requires generally better eyesight than is possessed by the average miner, but the behavior of a caged mouse or bird is a sure test.

The remark is often made, "We have no gas in our mine;" but if these mines were examined more carefully there would be found some, if not all, of the common mine gases. My experience teaches me that none of the mine gases may be considered as safe, even in small quantities. The fireboss must, therefore, use more care in examining the mine for gas. In hurrying to get over a large district the fireboss may overlook a small body of gas or slight a place that should be examined more carefully. Where gas is found it is important that the fireboss should give the closest attention to see that the proper quantity of air is passing on the entry and that the current reaches the working face of each chamber or room.

While every fireboss should have a thorough book knowledge of gases, he should depend chiefly on his experience. He must bear in mind that all gas is dengerous, in small or in large quantities. He must take no risk but mark every place, "Dangerous — Gas — Keep out" wherever gas is found on his Davy lamp. He must not hesitate to do his duty, at all times. Some one was quoted a while ago as saying that the fireboss was "an unnecessary expense," but the many lives and the thousands of dollars worth of property saved prove that the honest, conscientious fireboss is of the greatest value in the mines.

AN INDIANA FIREBOSS.

Brazil, Ind.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Surveying Problem

The large number of replies received in answer to this problem makes it practically impossible to publish all of them. We have, therefore, selected from these the following as being the best methods to use in the solution of such a problem:

First Solution.—By the laws of sines: *The ratio of any two sides of a triangle is equal to the ratio of the sines of the opposite angles.*

In the triangle *ADB*, designate the angles by the large letters *A*, *D* and *B*, respectively; then

$$A = 20°$$
$$D = 180 - 30 = 150°$$
$$B = 30 - 20 = 10°$$

By the law of sines

$$\frac{AB}{AD} = \frac{\sin D}{\sin B} = \frac{\sin 150°}{\sin 10°}$$

But since the sine of an angle is equal to the sine of its supplement and *vice versa*, and $AD = 100$

$$\frac{AB}{100} = \frac{\sin 30°}{\sin 10°} = \frac{0.5}{0.17365}$$

The length of the incline is then

$$AB = \frac{100 \times 0.5}{0.17365} = 287.93 \text{ ft.}$$

The depth of the vertical shaft *BC* is now easily calculated from the right triangle *ABC;* thus:

$$BC = AB \times \sin A = 287.93 \times \sin 20°$$
$$= 287.93 \times 0.34202 = 98.48 \text{ ft.}$$

The distance *DC,* from the mouth of the drift to the point where the upraise should be started, can then be calculated from the triangle *ABC* by subtracting 100 from the distance *AC* thus found, as follows:

$$DC = AB \cos 20° - 100$$
$$= 287.93 \times 0.9397 - 100 = 170.57 \text{ ft.}$$

or, directly from the triangle *DBC*, thus:

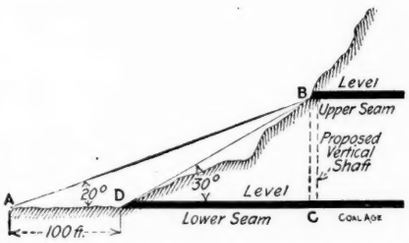
$$DC = \frac{BC}{\tan 30°} = \frac{98.48}{0.57735} = 170.57 \text{ ft.}$$

Practically the same solution was received from the following:

David M. Wiliams, Scranton, Penn.
Geo. A. Kellum, Glen Carbon, Ala.
Raymond Parks, Charleston, W. Va.
R. F. McKay, Brier Hill, Penn.
J. E. Jones, Danville, Ill.
Thos. R. Hay, Canton, O.
Wm. L. Powell, Edwardsville, Penn.
Jos. Northover, Seanor, Penn.
Walter E. Culler, Hymera, Ind.
Hubert J. Merwin, Knoxville, Tenn.
Henry T. Evans, Scranton, Penn.

Second Solution.—By the solution of the right triangles *ABC* and *DBC*, which have the common side *BC* and are right angled at *C*,

$$AC \tan 20° = DC \tan 30°$$



CROSS-SECTION SHOWING TWO COAL SEAMS OUTCROPPING ON HILLSIDE

Then,

$$\frac{DC}{AC} = \frac{\tan 20°}{\tan 30°}$$

and

$$\frac{DC}{AC - DC} = \frac{\tan 20°}{\tan 30° - \tan 20°}$$

$$\frac{DC}{100} = \frac{0.36397}{0.57735 - 0.36397} = \frac{0.36397}{0.21338}$$

$$DC = \frac{100 \times 0.36397}{0.21338} = 170.57 + \text{ft.}$$

The length of the incline is then found by adding 100 to the value of *DC* just found, and dividing the sum obtained by the cosine of 20 deg., thus,

$$AC = DC + 100 = 170.57 + 100$$
$$= 270.57 \text{ ft.}$$

and

$$AB = \frac{AC}{\cos 20°} = \frac{270.57}{0.9397} = 287.93 \text{ ft.}$$

The depth of the vertical shaft is then

$$BC = AB \times \sin 20° = 287.93 \times 0.34202$$
$$= 98.48 \text{ ft.}$$

or,

$$BC = DC \times \tan 30°$$
$$= 170.57 \times 0.57735 = 98.48 \text{ ft.}$$

Practically this solution, or similar ones have been received from the following:

Chas. Lamb, South Bethlehem, Penn.
M. S. Hachita, Wilkes-Barre, Penn.
E. C. Northover, Johnstown, Penn.
John Stevenson, Lethbridge, Alta., Can.

Third Solution.—By a principle of trigonometry: The sine of any angle is equal to twice the product of the sine and cosine of half that angle. Therefore,

$$\frac{BD}{100} = \frac{\sin 20}{\sin 10°} = \frac{2 \sin 10° \times \cos 10°}{\sin 10°}$$
$$= 2 \cos 10°$$

and

$$BD = 100 (2 \cos 10°) = 200 \cos 10°$$

Then, for the depth of the vertical shaft, since the $\sin 30° = 0.5$

$$BC = BD \sin 30° = \frac{BD}{2} = \frac{200 \cos 10°}{2}$$
$$= 100 \times 0.9848 = 98.48 \text{ ft.}$$

The other values are then found in the manner previously described.

V. Srajn, Hymera, Ind.

Other formulas not included in those already given are:

$$BC = \frac{100}{\cot 20° - \cot 30°} = \frac{100}{2.7475 - 1.7321}$$
$$= \frac{100}{1.0154} = 98.48 \text{ ft.}$$

This method of solution was used by
John Sanderon, Red Lodge, Mont.
H. M. Ernst, Sturgis, Ky.

Systematic Timbering

Is there any advantage to be derived, in respect to the safety of life and the economy of operation, by adopting a uniform system of timbering in the working places in a mine, provided the system so adopted is wholly carried out, and is suitable for the existing conditions in each case? PATRICK NAIRN.
West Newton, Penn.

A uniform system of timbering adapted to existing conditions, if regularly carried out, is of great advantage, for several reasons. The overburden or roof pressure is evenly distributed on all the timbers; and, as a result, the life of the timber is prolonged. There is less danger on account of lack of judgment on the part of the miner in setting posts. The timbering of a place is not so apt to be delayed or indefinitely postponed at the will of the miner. Systematic timbering will generally avoid an unexpected roof fall at the face, due to a hidden slip in the roof and reaching backward over the miner. In the end, there is less waste of timber and the coal is mined in better condition. There will be a less loss of pillar coal, as the room pillars will be preserved in better condition.

Byproducts in Coking

Referring to the question of the coking of coal at our mine, I would like to ask if you would kindly name some of the most important of the byproducts obtained in the manufacture of coke.

MINE FOREMAN.
McDowell, W. Va.

The most important of the many byproducts, in coke manufacture, are ammonia, and a large number of tarry products, together with coke-oven gases, which are utilized both for illuminating purposes and as fuel gas.

Fifth Root of Numbers

Kindly give a formula for, or explain the method of extracting the fifth root of a number?

CHARTER MEMBER.

Starford, Tenn.

The operation of extracting the fifth root of a number is a long and complicated process. In practice, we do not recommend anyone to attempt to remember the rule for extracting the fifth root. If one is familiar with logarithms, the simplest way of extracting any root of a number is to divide the logarithm of the number, by the index of the root, and find the number corresponding to the resulting logarithm, which number will be the desired root.

In case one does not understand the use of logarithms, we would suggest the more simple plan of ascertaining the fifth root of a number by trial. For example, take any number and multiply it into itself five times (using the number five times as a factor). If the final product is greater than the given number, of which the fifth root is desired, the trial number is too large, and a lesser number must be taken. A few trials will show between what two numbers the fifth root lies. A closer approximation may then be had by adding a decimal figure to this number and again multiplying the number so increased, five times into itself. The final product will show whether the decimal figure taken is too large or too small. The same process may be repeated indefinitely. This is the simplest practical method of finding any root of a number.

For example, let it be required to find the fifth root of 525:

1st trial,

$$3 \times 3 \times 3 \times 3 \times 3 = 243$$

2d trial,

$$4 \times 4 \times 4 \times 4 \times 4 = 1024$$

The given number lies between these two products, and, therefore, its fifth root must lie between 3 and 4.

Now, to find a decimal figure try

$$3.5 \times 3.5 \times 3.5 \times 3.5 \times 3.5 = 525+$$

Approximately, therefore,

$$\sqrt[5]{525} = 3.5$$

Abandoned Places in Mines

An Indiana mine superintendent recently asked the following question: Supposing I had a pair of entries with, say 15 rooms turned off each entry, and it is decided to abandon this section of the mine. The places are giving off a good deal of gas. What method would you suggest of dealing with these abandoned places? Should the entries be sealed off or should this section be ventilated by a sufficient air current. The workings are in No. 5 seam, which is about 4 ft. thick, and it is necessary to take up from 8 to 15 in. of bottom in order to make the necessary headroom for the loaded cars and mules.

In reference to this question I realize that a large number of mine bosses and superintendents prefer to wall off such an abandoned section of a mine by building substantial air-tight stoppings, at the mouth of the section. They do this to economize the air for use in other parts of the mine. My own experience leads me to condemn the practice of closing or sealing off a section of old workings where considerable gas is being generated.

It is often necessary to seal off a certain section in a mine to stifle a gob fire, but when this necessity does not exist and the place is to be abandoned, is it not better to draw the timber and let the place cave in as far as possible; and to thoroughly ventilate all places still standing, so as to avoid any accumulation of gas that would endanger the mine?

JOHN SUTTON,
Fireboss, Wizard Mine.

West Terre Haute, Ind.

Our correspondent has drawn attention to an important point in reference to abandoned workings. A large abandoned area is always a menace to the security of the mine, and particularly so when the mine generates marsh gas, or the coal has a tendency to spontaneous combustion, which would cause the generation of gas in the old workings.

We endorse heartily the suggestion that when the necessity exists to abandon any section of a mine, it is far better to draw the timber and allow the place to cave in, rather than to seal off such abandoned places. It is always a difficult matter to thoroughly ventilate abandoned places.

Proposed Ventilation System

Referring to the invitation of the author of "Proposed Ventilation System," published in COAL AGE, July 13, p. 48, that the plan he proposes in his article be thoroughly discussed and criticised, I would suggest that if this system were to be compared with the effect produced in the Hulton explosion, England, Dec. 21, 1910, when 344 lives were sacrificed, it would be found ineffectual in staying the explosion.

I would like to ask if an explosion occurred in No. 1 right or left would it not poison the mine air throughout the mine? This is the way it appears to me after a cursory glance at the article, but I admit that I may not fully understand the author's plan. There does not appear to be any reason why he puts crosscuts between the two main-return air courses. I shall watch this discussion with interest.

JAMES ASHWORTH.

Vancouver, B. C., Canada.

We think Mr. Ashworth's knowledge and experience in the study of mine explosions will lead him, after a closer study of Mr. Davies' proposed plan, to the conclusion that the provision of the weak stoppings, at the points indicated, will go far toward lessening the force and extent of the initial explosion. It would not be claimed for a moment, by any intelligent man, that conditions could not exist which would make possible the propagation of an explosion throughout the entire mine. The accumulation of gas or dust in the workings would, of course, make this possible, under any plan of working, but the point Mr. Davies has tried to emphasize in his article is that the proposed plan combines some features which will tend to reduce the force and extent of an explosion. In any case, it is assumed that the conditions throughout the mine are maintained as far as possible, at least not to invite the propagation of a local explosion, should one occur.

The other chief feature included in the proposed plan is the provision made for the escape of those who are fortunate enough not to have been injured by the blast. The plan further provides for the quick recovery of the mine by making it possible, under any reasonable supposition, to circulate a fresh-air current through any affected section or sections of the mine.

We are free to express the opinion that the plan as proposed by Mr. Davies is worthy of the most careful consideration on the part of all practical mining men to the end that the same may be improved and developed, in respect to any features that would increase its efficiency and render it more perfect. It is generally the unexpected that happens, in any case of this kind, and the best we can do is to consider carefully all possible reasonable conditions that may arise, and provide in every practicable way to meet them. We have no doubt but that this discussion will be taken up by the readers of COAL AGE, and that the results attained will be of great benefit.

Coal in South Wales

What is the character of the coal in South Wales?

New York City. INQUIRER.

The coal in the South Wales coal field is particularly noted for its characteristic as a first-class steam fuel. The area of the entire field is approximately 1000 square miles, comprising 400 square miles of bituminous, 400 square miles of anthracite, with 200 square miles of semi-bituminous, smokeless and bastard anthracite. The field is divided into two elongated basins by an anticlinal ridge running east and west in a somewhat sinuous course. Water is often met with in collieries which have been worked from the outcrop. The deeper seams yield considerable quantities of gas, while the upper ones are comparatively free from it.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Montana State Coal Mine Inspectors' Examination

(Selected Questions)

Note—Montana has set the pace for simple examinations. At the last session of the Board held for the examination of candidates for the office of State Coal Mine Inspector, 216 questions were propounded, in 15 papers, the several sessions making a total of 42 hours. The questions covered practically all the subjects of practical mine engineering. An average of 75 per cent. was required of all candidates. The examination included the following subjects: arithmetic; surveying and mapping; geology and prospecting; methods of working coal beds; timbering; ventilation; mine gases; explosive gases; firedamp; safety lamps; coal dust and shot firing; machinery; practical work; mining laws of the state of Montana; accidents.

Arithmetic

Ques.—Work out the solution of the following by proportion or "rule of three:" If 126 tons of coal cost $248 what will 178 tons cost, at the same rate?

Ans.—Write the tons for the first couplet or ratio, expressing the unknown or required cost by x; thus,

$$126:178::248:x$$

$$x = \frac{178 \times 248}{126} = \$350.35$$

Ques.—From an entry 10 ft. wide and 6 ft. 6 in. high, driven at the rate of 5 ft. per day, how many cubic yards of material will be taken out in six days?

Ans.—The area of cross-section of this entry is $6.5 \times 10 = 65$ sq.ft. Driving the entry at the rate of 5 ft. per day, for 6 days, the amount of excavation will be, since 27 cu.ft. = 1 cu.yd.,

$$\frac{65 \times 5 \times 6}{27} = 72.22 \text{ cu.yd.}$$

Surveying and Mapping

Ques.—What is the most suitable and accurate instrument for measuring distances?

Ans.—A steel tape, 50 to 100 feet in length, according to the work for which it is desired. The tape should be graduated in feet and each foot divided into tenths and hundredths. This style of graduation is used in all engineering work and is more suitable than a graduation in feet and inches.

Ques.—Why are the east and west points reversed on a compass?

Ans.—The east and west points on a compass are reversed to enable the correct reading of the direction of the sight line, from the position of the north end of the needle, in the quadrant. The reason will be readily seen when it is remembered that the needle remains stationary north and south while the compass is being sighted to a given object In a plain compass, the zero of the graduated circle corresponds to the sight line of the compass and is fixed. Suppose, now, the object sighted is in the northwest quadrant. The compass sights must be deflected to the left of the meridian, while the needle, which still points north, will occupy the quadrant on the right of the sight line. It is easy to see that this quadrant lying on the right of the sight line of the compass must be marked NW; because whenever the compass sights are deflected to the left of the meridian the needle stands to the right of the compass sight line and *vice versa*. When the compass sights are deflected to the right of the meridian or northeast the needle will occupy the quadrant on the left, marked NE.

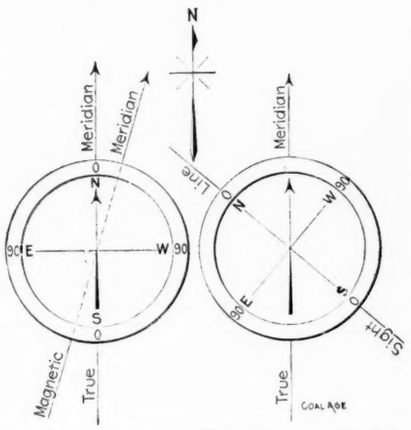


Diagram Showing Why *E* and *W* Are Reversed on a Compass

In the accompanying figure, the compass shown on the left is sighted due north and the needle, supposing there is no declination, points north and reads zero on the graduated circle. The compass shown on the right, in the same figure, is sighted on an object lying in the northwest quadrant or to the left of the meridian. The zero of the graduated circle has now swung to the left of the meridian and the needle being stationary occupies the quadrant on the right of the sight line. This quadrant is marked NW. so that the correct bearing of the object sighted can be read directly from the needle.

Ques.—(a) Does the needle point to the true north, in all parts of the United States? (b) What is the declination of the needle in this locality (Montana)?

Ans.—(a) No; the magnetic needle only points to the true north at places situated along a line that, at the present time, runs approximately north and south through the center of Ohio and the Carolinas. This is called the "agonic line," because the needle, at all places on this line, has no declination but points to the true north. At places lying east of this line the needle has a declination to the west, or points to the west of the true north. At places lying west of this line the needle has a declination to the east or points to the east of the true north. At places lying west of this line, the needle has an east declination and points to the east of the true north.

Montana lies on the west of the agonic line and all places in Montana have an east declination. The declination for the central portion of Montana, at the present time, is practically 18 deg. east. That is to say, the needle, in Montana, at the present time, points about 18 deg. to the east of the true north. The direction of the needle indicates the direction of the magnetic meridian. In the accompanying figure to which previous reference has been made, the magnetic meridian lies to the right of the true meridian.

Ques.—What is meant by the declination of the needle?

Ans.—The declination of the needle is the angular divergence of the needle from the true north and south meridian line. The declination, at any place, at a given time, may be east or west from the true meridian. It is constantly but slowly changing, from year to year.

Ques.—How would you proceed to set off the course N42° 15′E?

Ans.—When using a declination compass first set off the proper declination of the needle on the compass. When this is done the sight line of the compass will correspond to the true meridian when the needle reads zero. In setting off the declination, in Montana, the zero of the graduated circle is moved about 18 deg. to the right of the sight line of the compass. Now swing the compass to the right or clockwise until the needle reads 42 deg. 15 min. in the quadrant indicated by the letters N E, or the quadrant on the left of the sight line of the compass. The compass will then be sighted properly on the given course.

Ques.—What is the angle between the courses S 16° 40′ E and S 48° 15′ W?

Ans.—The given bearings lying on opposite sides of the meridian, the angle between them is found by adding these bearings together; thus, 16° 40′ + 48° 15′ = 64° 55′.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

First Aid Contest at Gibson, N. M.

By W. Hutchison,* M. D.

On July 4th, the first annual first aid contest for the New Mexico Division of the Victor-American Fuel Co. took place on the base ball grounds at Gibson, N. M., the participants being teams representing the four mines of the company in this district, viz.:—Weaver, Bartlett (instructed by Dr. Wm. Hutchinson) Navajo (instructed by Dr. G. M. Noonan) and Heaton (instructed by Dr. J. W. Stofer). The Navajo and Heaton teams tied for first place with a score of 97%. The Weaver team made 96% and the Bartlett team 93%.

On account of lack of time, there being so many other events on this day, it was decided by the members of the Navajo and Heaton teams to play off the tie at some time in the near future, the date will probably be set for Aug. 11th. The prize is a handsome silver loving cup, presented by the company. The team winning the cup has it in charge until the next annual event, but must win it three years in succession before it becomes their property.

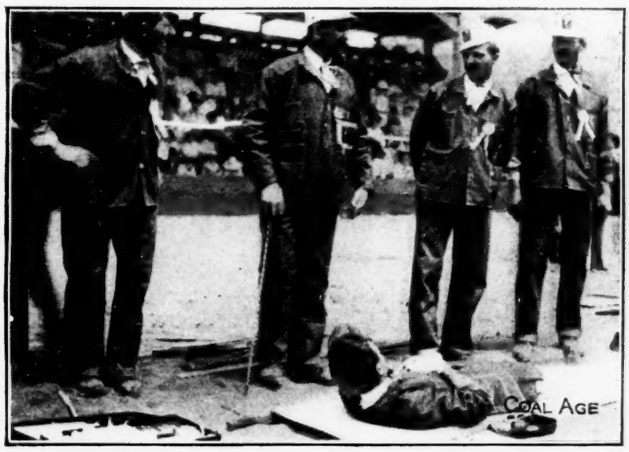
Notwithstanding the fact that the teaching of first aid is a comparatively new thing in this district, all the teams made a good showing, the dressings having been efficiently and accurately applied, most of them being very neat. In their anxiety to do the work quickly, some of the teams overlooked some simple matters, such as failure to open shirt collars in artificial respiration and to put on a sling in case of injury to the hand and arm.

The judges were three in number, two physicians; Drs. H. G. Wilson and E. W. Hooper and one mining man, Mr. S. E. Wood, formerly superintendent for the company at the Heaton mine. All being from Gallup, N. M.

To stimulate interest in this work the company has issued certificates to those who have attained suitable proficiency in the work. The value of first aid teaching is becoming more evident every day. A few months ago an injured person arrived at the hospital in practically the same condition in which he was found when injured. While now the patient comes in with his wounds dressed in a manner that would do credit to the average doctor.

*Gibson, N. M.

Navajo Team Applying Dressing for Fracture of Leg



The Same Team Awaiting Judge after Dressing Is Completed

Coal Miners and Tuberculosis

By Jonathan A. Wainwright* and Harry A. Nichols†

We have all heard that miners claim to be immune from tuberculosis, that coal dust prevents the ravages of the disease and that it even has a curative effect when tuberculosis is once developed. The present article is an inquiry as to whether these ideas have any basis in fact, and if so, why.

An inquiry into the relationship between any disease and the occupation or mode of life of the person it attacks is always a complex matter. This complexity becomes more marked when the disease in question is intricately connected with social, sanitary, economic, racial and other factors as is the case with pulmonary tuberculosis. It is doubly so when the persons to be considered are as varied as to race, habits of living, diet, intelligence, etc., as are our anthracite mineworkers.

*Chief surgeon, Moses Taylor Hospital, Scranton, Penn.

†United States Medical Corps, Washington, D. C.

Note.—Part of paper read before the Laennec Medical Society at Baltimore, entitled "The Relation between Anthracosis and Pulmonary Tuberculosis."

Environment and the Mine Worker

We can account to some extent for part of the presumed low mortality from tuberculosis without making any extended inquiry. We know now, for instance, that tuberculosis is essentially a disease of those who live under crowded conditions both at home and at their work.

But mine workers are never so crowded; seldom are there more than two or three and often only one man working in a large chamber. Furthermore, the spread of infection among the men at work is practically impossible, as the moisture in the mines prevents the sputum which is deposited from drying. The germ must either die out from lack of nutriment or be washed away by the mine waters.

The conditions above ground also favor a low death rate from tuberculosis among miners. While in the mining region far too large a number of foreign-

ers will often occupy a small house, there is none of the excessive overcrowding found in the city tenements.

On comparing the workers in other trades with the miners we find that the latter usually live with only their own families in single or double houses. Even the dwellings which are overcrowded by foreigners are separate, so that the number exposed to infection from a consumptive boarder is comparatively small.

Open Air Work and the Daily Bath Arrest Consumption

The habits of mine workers also tend in a measure to free them from tuberculosis. For instance, the mine employee frequently has to walk several miles to the shaft or drift through the thin air of high altitudes. Comparatively few mine workers travel to and from their work in a sputum-soaked street car.

Furthermore, a miner's house is generally provided with some yard space, large or small, and the time which he spends out of the mine is much more frequently devoted to outofdoor work than that of the tenement dwellers of the city. If he is not working in his garden, he is probably to be found outside the house whiling away his spare time. The fact that a complete bath is imperative daily also must have a marked influence on the health of miners.

Alcoholism as a Predisposing Factor.

It is, of course, a fact that for every trade a large proportion of its tuberculosis mortality really belongs to the saloon. The effect of alcoholism among miners is probably not different from that of other workers of the same social grade. These general factors cannot account for all the differences in mortality from tuberculosis which really seem to exist. It is probable that there are other factors among which anthracosis* seems to be important.

Before going further it would be well to consider what evidence there is, to suppose that low mortality among miners is an actual fact. One naturally turns to the statistics, but in considering the effects of a disease like tuberculosis on miners in relation to its effects on those of any other occupation, it has well been pointed out by Miss Brandt† that there are two important factors to be considered as having an influence.

Is There Any Selection of Those Who Are Fit for Mining?

One is whether there is a sort of natural selection at work, by which only the stronger youths take up the occupation, so that from the start we have a more or less picked class in which tuberculosis would be rare.

Secondly, we are led to ask whether it is a fact that miners who have contracted tuberculosis seek lighter work and finally, at death, are registered with this second occupation to which they really do not belong, thereby artificially reducing the true death rate among miners and swelling it in an easier trade.

In regard to the first suggestion, it does not seem that any one who is at all familiar with coal-mining people will think that the process of natural selection works in any way to make them a picked class. Boys and men take up mining not because they are particularly strong but because it is the easiest work to obtain in the region in which they live, and it becomes, in a way, their natural destiny.

Is There Any Removal of the Unfit?

As to the problem whether the weakly even when admitted to the mining occupation, are not weeded out later, it may be said that mining is not such a laborious occupation as to have this effect. It is certainly not more trying than that of the farm laborer, who has a tuberculosis mortality nearly equal to that of the mine workmen. It is certainly not more laborious than that of blacksmithing, where the mortality is about twice as high.

In regard to the second point, whether consumptive miners do not drift into another trade, it seems that here too we cannot find an appreciable factor in reducing the estimated tuberculosis mortality of miners. Most consumptives continue at the occupation so long that when they do have to give up, they do not have the strength and ambition left to start in a new trade.

At death they are registered in the trade which they first followed or among the "unemployed." That these contain many who contracted tuberculosis while in active trade is unquestioned, but this factor should balance in all occupations. We think that Schæffer*, of Pottsville, Penn., would have agreed with us that these two factors do not operate in the cases of coal miners.

He says of the boy starting to work in the breaker that "he grows up to be a lusty, sinewy youth who seldom troubles the doctors except when incapacitated by an accident." Schæffer quotes Ray, a mine inspector in Ohio, as follows:

"With current sufficient to carry off obnoxious gases, smoke and at least most of the dust, mining becomes a healthy and pleasant occupation, notwithstanding what has been said about its drawbacks. Men who go from the farm and shops to work for a season in mines rarely go back to their old work."

*Miner's asthma.

†Handbook on the Prevention of Tuberculosis, Charity Organization, New York City.

*Schaeffer, Hygiene of Coal Mines Ziemssen's Encyclopœdia, 1871.

Miner's Nystagmus

An interesting letter, received by James Ashworth, from a correspondent in South Wales, states as follows: "I have made some very interesting tests on men who have nystagmus, to determine their ability to detect a cap on a lamp in the presence of gas. Of a total of 35 men examined, only two were correct in their determination of the observed cap, but all the 35 men could see a 3-per-cent. cap. A 2-per-cent. cap was often called a 'trace.'

"I have taken some very interesting photometric measurements underground, with a special photometer, and hope to publish my results shortly. I think there is a future before the electric lamp with a suitably arranged reflector. Your white enamel streak on the lamp glass improves the lighting power of the lamp by 12 per cent., according to my measurements, and I think this is a valuable addition to a safety lamp. I should be very glad if you could give me any information as to the prevalance of nystagmus in America, generally. I was very glad to receive the information on the freedom from nystagmus in the Crows Nest Pass mine."

[Coal Age will be glad to receive items relating to the frequency or extent of nystagmus in mines in this country, or the absence of this disease in the mines. We hope readers will send us this information generally.—Editor.]

A Mining School in Germany

Westphalia, Germany, has a mining school at Bochum, supported by the Westphalian Miners fund, a levy of one eighth of a cent per ton of output. This originated over three and a half centuries ago with the ordinance of Duke William IV of Cleves in 1542. This school is intended to supply the needs of the Westphalian mining district only, other German districts possessing similar schools.

The main school at Bochum, maintains a number of preparatory schools throughout the district where the working miner and the would-be colliery official may receive instruction. Miners, 18 years of age, who have been employed in the mines for the last two years may be admitted to the preparatory schools. The course lasts for two years with a compulsory attendance of 8 hours weekly. All instruction is free. The main school at Bochum is the principal teaching center and the only one giving a technical training.

The average age at which men leave this school to accept an official position is 28 years. The central school is equipped with well furnished laboratories, a library of nearly 20,000 volumes, a complete museum of mining methods and practices, a fine geological collection, and a gallery for practice in the use of rescue apparatus. The men taking the course at the Bochum central school work 8 hours a day in the mine and then give four hours to study. This system is intended to enable the most competent miners to qualify for positions as officials or under managers.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Bureau of Mines has just completed an investigation into the use of fuel in steam boilers, from which it draws the conclusion that the present capacity of such boilers can be very greatly increased, probably three or four fold by forcing over the heating surfaces three or four times the weight of gases now passed over the surfaces in question. Inquiries into the transmission of heat into steam boilers are in progress in the Bureau of Mines in order to test the methods by which mineral fuels may be more efficiently used. With reference to the capacity of existing boilers, the investigators say: "It is possible to increase the capacity of many of the present boilers in this way without reducing their efficiency much; in fact, by proper arrangement of the heating surfaces the efficiency can be made higher than the present rating. The efficiency of any boiler can be increased by arranging its heating surfaces in series with respect to the path of hot gases. New boilers of high efficiency can be constructed by making the cross-section of the gas passages small in comparison with the length."

The outcome of the investigation is considered to show that a very considerable decrease in operating cost can easily be obtained. The statement of the results of the Bureau continues as follows:

Nearly a hundred years of practical investigation of boiler and furnace problems has resulted in little advance. Perhaps the main reason why many of the investigations failed to bring about progress was that boiler and furnace were considered a unit and were investigated together. Various combinations of boilers and furnaces have been built and tested without thoughtful planning. Many of the published results of such tests confuse the performance of the boiler and the furnace in such a way that it is difficult, if not impossible, to tell which of the two should be blamed or praised for the poor or good results obtained from the combined apparatus. Evidently, many persons have thought that the combined efficiency could be greatly increased by some mysterious manipulation.

The principles governing the combustion of fuel in boiler furnaces and the absorption of heat by boilers have been little understood. The dogmas that the area of grate should have a certain ratio to the area of the heating surface, and that it takes 10 sq.ft. of heating surface to make one boiler horsepower, seemingly had become so thoroughly fixed in the mind that they were hardly ever questioned. It is only within the last decade that a few engineers have broken away from the old rule-of-thumb methods and have begun to investigate the functions of the boiler and furnace separately. Their studies seem to mark the beginning of advance in steam-generating apparatus.

The boiler is the metallic vessel that contains water and steam and absorbs heat; consequently it should be studied as a heat absorber.

The furnace is that part of the steam-generating apparatus in which the potential energy of the coal is changed into heat; consequently it should be studied as a heat generator.

Stanley Steel Trust Investigation

The long expected report of the Stanley Steel trust investigating committee has now been issued, and turns out to be even more radical than had been expected. Considerable space is given to the relationships between coal concerns and the coal-carrying roads, and to their ownership of large amounts of mileage which are used for the purpose of transporting their ore and coal from points of production to the places where smelting is to be carried on. One of the leading recommendations made by the Committee is that Congress should pass legislation absolutely forbidding the existence of so called "interlocking directorates." This recommendation is made with a special view to correcting the conditions which exist in the coal industry and which have grown out of the desire of railroad companies to go on controlling the coal deposits, notwithstanding that under the interstate commerce law they are required to dissociate themselves from their coal holdings. The recommendations of the Stanley Committee, however, would apply not only to railroads and coal companies but also to similar relationships, through the interlocking directorate idea, existing between concerns like the United States Steel corporation and concerns engaged in mining coal or producing other materials for shipment.

Alabama

Gadsden—C. P. Ludwig has been retained by the receivers of the Alabama Consolidated Coal & Iron Co. as general superintendent and manager of their property. The mines are running again at full capacity. The employees will be paid for the first six days of the receivership. It is believed that the furnace here will be put into blast within the next few months.

Arkansas

Little Rock—The Mayer Coal Co., with offices in Kansas City, has purchased the entire coal properties of the Fidelity Coal & Mining Co. and the Fidelity Fuel Co., operating mines in the vicinity of Greenwood, Ark.

Colorado

Grand Junction—If present plans mature, Grand Junction, Colo., will own and operate the first municipal coal mine in the United States through the direct authority from the government. It is claimed that Grand Junction has a charter which will permit of its going into the coal business.

Illinois

Monmoth—A rich bed of coal has been discovered at Kewanee, at a depth of 35 ft., and the property has already been leased by a firm which is preparing the shaft for action. The depth of the bed is about 4 feet 3 inches.

Springfield—It is believed that a group of capitalists, headed by Samuel Insull, is now busy acquiring additional power plants in the rich coal-producing section of central Illinois. Francis S. Peabody, who is associated with Mr. Insull, is adding to his coal holdings in Christian, Sangamon and Montgomery counties, and at the same time is buying up electric-light plants. Mr. Peabody insists that he is buying these properties for himself, but rumor has it that he is acting on behalf of the Insull group.

Indiana

Indianapolis—The Indian Creek Coal Co., of Knox County, has recently appealed to the State Board in regard to an assessment levied upon their undeveloped coal land. It appears that the Supreme Court in a recent decision has held that undeveloped coal lands could not be assessed as coal-mine property, but must be assessed as real estate. This is the basis of the company's plea.

Jasonville—The Miami Coal Co. has purchased most of the mines of the Hoosier Coal Co., which were opened up several years ago and operated only a short time after their sinking. The intention of the Miami company is to reopen the mines. Both of the projects are fitted with the best mining machinery and said to produce a fine grade of coal.

Linton—An explosion of gas in the

Monon Coal Co.'s mine, in the Greene County field, on July 26, resulted in the serious burning of a number of miners. Considerable damage was done by the explosion, but the cause has not yet been determined.

Sullivan—The Union mine, which has been idle since the miners' strike settlement, has resumed operations July 23. Only 165 men were employed at this time, about one-half the usual number, but they work half time, alternating with the other half. The prospects are that a full force will soon be at work.

Terre Haute—Deals for more than 1000 acres of coal land in Fayette Township, Vigo County, have been closed by Hugh Shirkie. The property is near the land taken over by the U. S. Steel Corporation, where the largest mining plant in the state has been erected. The average price paid for the mineral rights was $50 an acre.

Kentucky

Henderson—The Peoples' mine, following the installation of a new screen, has exceeded its own best record recently. Its new record is 130 tons for three hours.

The Keystone mine has recently been taken over by M. M. Moser, and it is expected that work will commence after the necessary improvements have been completed. The Keystone has been closed for several years, failing to be a success under its former management. About 100 men are employed.

Pineville—The Continental Coal Corporation has been requested to establish a hospital in this city, and a large residence near the Louisville & Nashville depot is to be transformed into a hospital in August. The several physicians of the company will administer to the patients, and the institution will be for the benefit of the employees only.

Maryland

Cumberland—Another trunk line, extending from the Atlantic seaboard to the West, will be in service when the new Cumberland extension of the Western Maryland Ry. Co. is put in operation on Aug. 1. The line runs from Cumberland, Md., to Connellsville, Penn., a distance of about 87 miles, and represents an expenditure of about $13,000,000.

When this line is completed, the Western Maryland can boast of the shortest route to Pittsburgh. Thus, the opening of the Western Maryland extension is of vast importance to the coal trade, in that it will open up new markets to the mines located on the West Virginia division of the Western Maryland, thus placing them on an equal footing with coal properties located on the Baltimore & Ohio R.R. The coal and coke operators of Pittsburgh will also find a shorter seaboard outlet, and they will thus be able to compete with Baltimore operators for trade in the East.

The Western Maryland line connects with the Pittsburgh & Lake Erie R.R., a subsidiary of the New York Central, at Connellsville, Penn., over which the Western Maryland trains will enter Pittsburgh. Under the traffic agreement with the New York Central, the new road also gained an entrance into Chicago and other important centers in the great Northwest. Fast freight trains will immediately be established between the western and northwestern points, via the West Maryland and New York Central road. The route to Chicago is in the neighborhood of 60 miles shorter than any other system. Through passenger-train service will be established not later than the middle of October.

The company has expended millions of dollars in providing terminal and other facilities in order to handle the large traffic which it expects to handle under the New York Central agreement. The freight yards at Port Covington have been enlarged, and additional tracks have been installed at advantageous points.

Montana

Great Falls—Development of the rich coal fields of Hound Creek, in the southern part of Cascade County, which has hitherto remained untouched on account of their inaccessibility, is to be carried out by the Elks Creek Coal & Coke Ry. Co. The company controls the large body of coal land with beds running as high as 20 ft. in thickness, and surveys which have been made in the past few months demonstrate that the field can be reached by a line easy to construct, with a grade not to exceed 1 per cent. The line will be 40 miles in length, and will connect the Buick line of the Great Northern at Ulm station.

North Dakota

The U. S. Geological Survey has just published a report on the lignite in the Fort Berthold Indian reservation, North Dakota. The area described is that part of the reservation lying north of the Missouri River in Mountrail, McLean and Ward counties. The region is triangular, being about 25 miles from north to south and 39 miles from east to west.

The lignite is dark brown to brownish black but weathers to a pitchy black that on the dried weathered surface it looks like sub-bituminous coal, except that the fine woody structure is not destroyed and can always be detected by the naked eye, indicating that the lignite is derived largely from the remains of trees and heavy vegetation. Like most lignites, when exposed to the atmosphere, it checks, falls to pieces, and breaks into small irregular fragments with pitch-like luster and brown streaks. Twelve beds of lignite were counted in the columnar section exposed, none of them less than 1 ft. thick. For many years the only mining in this area was done by the Indians, but recently white settlers have entered along the edge of the reservation and taken out lignite at several places. In mining, a place is found where the cover is comparatively thin, 4 to 6 ft., but not so thin that the lignite is made worthless by weathering, the cover is removed, and the lignite taken out. According to a reasonable estimate the amount of available lignite in the area examined is approximately 1,800,000,000 tons. Test has been made of North Dakota lignite in the gas producer, and the results show that it is well adopted to this use. In these tests the lignite compares favorably with some of the higher grades of coal, and should that method of utilizing fuel become more largely employed, the extensive lignite fields of the West shall become a great source of wealth to the nation.

Ohio

Columbus—The Davis Collieries Co., which has a sales agency in Columbus, has large operation in various fields in West Virginia, reports considerable damage done to several of its mines by the storm of the past week. The smokeless mines at Coalton and Harding were put out of commission by the storm washing away the tracks and some damage was done to the mines in the splint district. In addition all the coke ovens had to be shut down because of the storm, as it was impossible to get coal to the ovens. The announcement is made that all of the mines and coke ovens will be in operation after Aug. 1.

Doylestown—The Collier mine, which has been in operation for some time, has become exhausted and closed down permanently. About 60 miners will have to seek work elsewhere.

Logan—The new Pittsburgh Coal Co. has announced the flooding of mine No. 1, which is the oldest of the company. The mine was being worked near an old entry when a lake of water was released. It will require several days to put the mine in operation.

Martin's Ferry—The 250 men, employed in the Black Diamond mine, who went on strike, July 18, have returned to work. The differences have not been adjusted, but the officials prevailed upon the men to return to work pending an investigation.

Pennsylvania

ANTHRACITE

Avoca—All of the mine men burned by the explosion of gas in Langcliffe colliery of the Delaware & Hudson Co. are expected to recover.

Kingston—The collapse of a scaffold in No. 4 mine shaft precipitated Foreman William Griffith to the bottom, killing him instantly. Two other workmen grasped projections in the shaft and rescuers saved their lives.

Plymouth—Two men were killed and two others injured in an explosion of mine gas in the old workings of the No. 8 slope, first east, of the Hillman vein at No. 2, D & H Colliery. The explosion that occurred on July 24 could be heard distinctly in every part of the mine. The pressure of the forced-out air was so great that it raised the carriage in the shaft several feet.

Scranton—The position taken by the Lackawanna Coal Co.'s officials in regard to the recent mine-cave question is as follows:

First, we propose to mine all the coal, regardless of the damage done to the surface.

Second, where a property is injured or totally destroyed by virtue of a mine cave, the company proposes, either to repair the damage and, while the repair is going on, to house the injured family, or replace as much as lies in our power.

South Bethlehem—One man was killed and five others injured on July 19, when clay, loosened by the rains, slipped back into a trench that was being dug at the new coke-oven plant at the Bethlehem Steel Works.

Wilkes-Barre—The new breaker of the Connell Anthracite Coal Mining Co., at Bernice, has been completed, and is now in full operation. It has a balling capacity of 1500 tons, and only 40 persons are necessary to operate it, due to modern and labor-saving machinery being used.

BITUMINOUS

Brownsville—The old workings in the Pike mine of the Peoples Coal Co. have caved in, and, as a result, houses in the vicinity have got to be vacated.

Carrolltown—Colliery No. 5 of the Logan Coal Co. has been closed down and the tipple nailed up. The 130 men employed there are seeking positions in other fields. The management claim they cannot compete with other companys in getting out coal at the prices realized and that the operation has been a losing proposition for some time.

Johnstown—The Manor Real Estate & Trust Co. will take over 9157 acres of coal and 1527 acres of surface in Cambria and Indiana counties, Aug. 1. This means that more than $1,000,000 will change hands and that new coal towns will probably spring up in the two counties soon.

Rockwood—It has been rumored that that a large coal company will be organized and operated soon in upper Turkeyfoot Township along the Ursina and North Fort R.R. Several hundred acres of land are in the option and several hundred more are sought.

Uniontown—Latest reports state that 17 miners have been drowned when floods, caused by a cloud burst, rushed into the mines in this vicinity. Superba, No. 2 mine at Evans Station and Lemont, No. 1 mine seem to have been the biggest sufferers It was stated by the officials of the Superba Co. that it will take at least 60 days to clear the mine of water and until that time the bodies which have not already been recovered, will have to remain where they are.

Virginia

Richmond—The last legislature passed a law providing for the protection of coal mines in this state under the direction of the labor commissioner, and, as the law only became operative June 14, that part of the provision has never been carried out. It is stated that a competent inspector has been secured and that his first work will be to conduct an investigation into the Gayton mine disaster. The legislature failed, however, to make an appropriation for the salary of the mine inspector, and his expenses will be paid out of the commissioner's allowance. At the close of two months he will be laid off until the next session of the legislature, when it is expected that ample provision for the inspection of mines will be made by the passage of a measure carrying an appropriation for the purpose.

Washington

According to E. W. Parker, of the U. S. Geological Survey, Washington is the only one of the Pacific Coast states in which coal mining is an industry of any importance. The production of coal for 1911 in the State of Washington was 3,572,815 short tons, valued at $8,174,170. The competition of the California fuel oil, however, is making itself felt, even the railroads having their own coal mines are using fuel oil in their locomotives on the ground that a sparkless fuel gives protection against forest fires. Some of the Washington coal mines are within less than 50 miles of Puget Sound, yet most of the steamers plying in those waters are using oil for fuel, the saving in labor and cleanliness of the liquid fuel giving it a decided advantage over coal, even when the latter may be cheaper at first cost. The decreased production of coal seems to be due to no other cause than the substitution of oil for coal as a fuel.

The number of men employed in the coal mines of Washington in 1911 was 6498, who worked in their 225 days. The returns to the U. S. Bureau of Mines show that 25 men were killed in the coal mines in 1911, and the death rate per one thousand employees was 3.85. The number of tons mined for each life lost was 89,883.

West Virginia

Charleston—Serious conditions still exist in the Paint Creek district, where a deputy sheriff has been killed and many persons injured in a battle between the miners recently. The rioting was resumed and miners or sympathizers attempted to approach the mine workings. They were met by a force of deputies and a battle resulted. The later used their weapons and there was reported that a number of miners were wounded.

The state tropps camping near the scene were hurried from their tents and are now in command of the situation. Wires in the vicinity have been cut down and it is impossible to learn the names of the deputies killed or those of the injured strikers, although some reports say that he was Deputy Sheriff Southpin.

Wyoming

The U. S. Geological Survey estimates the quantity of coal in the ground in Wyoming as exceeding that of any other state in the Union, except North Dakota. This quantity is due in the first place to the large number of coal formations in the state, second, to the number and thickness of the coal beds, and third, to the size of the fields, about 50 per cent. of the area of the state being underlaid by coal-bearing formation.

The largest coal field of the state is that of Powder River, which lies in the basin between the Black Hills and the Big Horn Mountain, and extends from the North Platt River to the Montana line. The coal mined in Wyoming is bituminous and sub-bituminous. The Powder River field alone embraces an area in Wyoming of 15,000 square miles. Of this area, at least 11,000 square miles are underlain by coal beds known to be more than 3 ft. thick, and the remainder may in places contain beds thick enough to work.

Centennial—The Domestic Coal Co. will shortly enter the field in competition with other corporations engaged in coal mining in Sheridan County. The company's mines are to be located south and west of the city limits. According to one of the promoters, the local company has, under lease, close to 1000 acres of valuable coal land, which it is planning to develop. The coal is of high class quality and it is believed to underlie practically the entire tract controlled by the company.

Rock Springs—The Union Pacific Coal Co. is doubling the capacity of its electric-light plant for lighting and power purposes, and a central plant is to be installed soon. The Union Pacific Co. is taking every precaution to guard against the loss of life in its mines. It believes that by the installation of electric drills and machinery it will be possible to do away with the day shooting and allow shots to be fired at night only.

Personals

H. H. Pinckney has been appointed District Mine Inspector, to succeed T. A. Grady, by John Laing, chief of the Department of Mines.

H. B. Wright, formerly Chief Engineer of the Pocahontas Consolidated Collieries Company is again with that company doing special engineering work, and is located at Pocahontas, Va.

Thomas Horne, has resigned as manager of the McGillvry Creek and Coke Company, in Southwest Alberta, Canada, and intends visiting Scotland; George Kellock, of the International Coal and Coke Company, has succeeded him.

A. R. Brown, special agent in charge of the rescue station of the U. S. Dept. of Mines, has resigned his position, and will become assistant superintendent of the second division of mines of the Tenn. Coal and Iron R.R Co., beginning August 1. His successor has not yet been appointed.

Industrial News

The Imperial Coal & Coke Co., Zixima, Ala., has placed an order for a Terry turbine-driven 150-kw. generator set.

Coal-mine users of electric apparatus are keenly interested in the refillable fuse, manufactured by the A. F. Daum Co., Pittsburgh. A speciment of this new fuse is sent upon request.

The Consolidated Coal Co., Fairmount, W. Va., is about to add to the equipment of its colliery at Jenkins, Ky., three 10-ton, 42-in. gage electric mining locomotives, of the General Electric Co.'s manufacture.

The Chicago, Wilmington & Vermilion Coal Co., Chicago, Ill., will soon add to the hauling equipment of its mines ten 6-ton, 42-in. gage electric mining locomotives, which have been ordered from the General Electric Co.

The Horden Colliery, Ltd., Yarm, England, has purchased from the Ruggles-Coles Engineering Co., of New York, three class A-14 dryers for drying coal, reducing the same from 14 per cent. to 4 per cent. of moisture.

The Peabody Coal Co., of Chicago, which has recently taken over all the mines in Montgomery County, with the exception of one, will open up an office in St. Louis, and will cater to the southwestern trade on Montgomery and Williams County coal.

The Clearfield Bituminous Coal Corporation will soon install in its West Branch mine, at Cherrytree, Penn., new apparatus, consisting of one 200-kw. rotary converter, two 14-kw. exciters, three 70-kv.-amp. transformers and a -switch board apparatus. Orders for this equipment have been placed with the General Electric Co.

To meet the demand of the railroad companies and large manufacturing firms for railroad-track scales of greater capacity, durability and accuracy than have in the past been required or manufactured, the Standard Scale and Supply Co., of Pittsburgh, has designed a new type of scale and construction, which will meet the most rigid requirements. They are sending out a folder describing its construction minutely.

Chronology of Coal Mining for July

July 1—Attorneys, representing the miners of Pain Creek district, asked court for injunction to restrain coal operators from maintaining a guard system.

July 3—Fourteen miners were killed in an explosion at Osterfield Colliery, Germany.

July 8—Twenty men were killed by a premature explosion of a dynamite blast, at the mines of the Braydon Copper Co., Santiago, Chili.

July 9—A double explosion at the Cadeby Mine, Yorkshire, England, killed 88 miners.

July 11—Two miners were entombed by a fall of rope in the Burnside Mine, at Shamokin, Pa. They were found dead by a rescue party.

July 16—Six miners were killed, and three seriously injured in an explosion at the Gayton Coal Mine twenty miles south of Richmond, owned by the Old Dominion Coal Development Company.

July 17—Four men are dead, and four hurt, as the result of a gas explosion at No. 5 Colliery, at the Lehigh and Wilkes-Barre Coal Company, of South Wilkes-Barre.

July 18—Nine men were burned in a gas explosion at Langcliffe Colliery, Avoca, Pa.

July 19—One man killed outright, and several injured by a coal dust explosion at a lignite Colliery in Halle, Germany.

July 24—According to the latest report, twenty men are supposed to have been drowned in the Superba No. 2 Mine, at Uniontown, Pa. The flood was due to a cloud burst.

Obituary

We regret to record the removal by death of Mrs. Emily Mary Clifford, beloved wife of William Clifford. Mrs. Clifford was born at Swallownest, Yorkshire, England, Apr. 12, 1841, and died, after a brief illness, at her residence, North Park, near Jeannette, Penn., July 17, 1912.

Mr. Clifford is well known to the engineering fraternity, being one of the oldest English engineers in this country. Some years ago Mr. Clifford came to the United States and established himself at Pittsburgh, as the representative of the English firm manufacturing the Capell fan. It was largely through his efforts that this fan was introduced into many American mines. Within a few years past Mr. Clifford severed his connection with the Capell company and engaged in the manufacture of mine fans, independently.

COAL AGE extends its warmest sympathy to Mr. Clifford in his bereavement, and, in so doing, they express the feeling of all his associates.

Construction News

Whitley City, Kentucky.—A company is now being formed to build an electric line between the towns of Whitley City and Stearns. The Stearns Coal Co. will probably furnish the power, as it now operates an electric plant at Stearns. It is thought that this plant is sufficient for the needs of the proposed line.

Sturgis, Ky.—The West Kentucky Coal Co. has acquired 150 acres of land, and will sink a shaft on the new holdings. The price paid for the property was $21,000.

Hellier, Ky.—The Allegheny Coke Co., formerly the Mitchell Coke Co., has closed down the Mitchell mine for six months, pending the construction of 150 new coke ovens. The course of a creek, which is now in the path, will be changed by means of a ditch. The course of the railroad also, will be slightly altered.

Evansville, Ind.—The Jones Manufacturing Co. has filed articles of incorporation with the Secretary of State. The object of this company will be to engage in the business of manufacturing blasting powder and other explosives for the use of miners. They will also manufacture such devices and contrivances adapted for the use and employment in laying and securing in position tracks or rails in mines. The capital stock is $10,000.

Spokane, Wash.—Articles of incorporation have been filed for the Elk Lake Coal, Coke and Ry. Co., which is capitalized at $3,000,000, and plans to build a road from Ulm, connecting with the Great Northern R.R. to the coal mines at the head of Elk Creek, in the Big Belt Mountains. The company owns several thousand acres of coal land, and much of the stock is owned by Spokane people.

Springfield, Ohio.—A company, to be known as the Scioto Valley Coal Co., has been incorporated for $10,000. The new company has leased a thousand acres of land in White County, and they will erect a spur to connect with the D. T. & I. for shipment to the city.

Lancaster, Penn.—The new railroad to be built from Lancaster to South Bethlehem, for the purpose of reaching the Bethlehem Steel Co.'s works and coking plant, is said, on reliable authority, to be an independent venture, and not a branch of the Pennsylvania Road. The new road will be 124 miles long.

Athens, Ohio.—William Kobs and son were here a few days last week looking at the tract of coal land near Curtice Junction. The outlook seems good and they are optioning about 1000 acres of coal land at $25 per acre. It is expected that a test machine will be on the land soon.

Monongahela, Penn.—E. D. Neel has the contract for the sinking and the hoisting of an air shaft, which is being sunk on the Williams farm, to connect with the workings of the Catsburg mine.

Camfield, Ohio.—The Dunn Coal Co. has leased several acres of land, north and east of Beloit, and they propose to open a shaft, and mine extensively for shipment.

Latrobe, Penn.—The Unity-Connellsville Coke Co. has completed 20 additional ovens, at their Elizabeth plant. This gives them a total of 100 ovens, 80 of which are in operation. The remaining 20 will be fired next week.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The past week has witnessed a decided strengthening of the bituminous market and, if anything, a further tightening in anthracite. In addition to this the expected car shortage has finally developed, and indications are that it will not be long before this reaches serious proportions.

The anthracite situation continues hard and supplies are only about equal to those normally on hand the first of April. With mining up to the highest point, the producing companies all concede that they are behind on orders. There is some excess of the steam sizes, but otherwise the demand is the strongest ever experienced at this period of the year. It is freely predicted that there will be a serious shortage this fall and anxiety is quite evident in all quarters.

In the East, bituminous has improved materially. Deliveries are only made on specific orders and indications are that the low prices of June and July will not be duplicated during the rest of the season. This is probably due to the continuous curtailment policy adopted by some of the companies. There are no longer any heavy accumulations, coal is being closely held and there is an entire absence of demurrage. The demand is more insistent than at any time since the strike and business is now on a fairly profitable basis.

The Lake trade in Ohio has fallen off slightly, although the general tone remains good, and operators are discussing an advance in prices. There has been some improvement in slack, manufacturing is holding up strong and steam requirements are fair. In West Virginia some shippers have been hard pressed to fill orders, contracting is on a firm basis with prices higher than those prevailing at this time last year and the indications are for a much stronger market.

The car shortage in the Middle West has seriously interfered with the production, made coal more difficult to obtain, and resulted in a slightly higher price level.

Boston, Mass.

Bituminous in this market is at the turn of the road. There are many signs that the low prices of June and early July will not be duplicated the rest of this year, and that the trend of the trade is decidedly improved. There is no heavy accumulation now at any point, either at shipping piers or at the Eastern distributing centers, and it is felt that the continued curtailment is showing some results. Certainly the outlook is more hopeful than at any time so far this year.

The Pennsylvania grades are being closely held, and there is an entire absence of demurrage coal. The agencies are cautious about promising spot shipments, for in most cases, coal is now coming to tide only on specific orders. The same thing applies to Georges Creek, and quotations on that grade are quite as firm as they have been all season.

Anthracite has not caught up any during July. The normal receipts in this market for April have not yet been reached, and with supplies three months behind it is hard to see anything but an active demand for this grade straight through the season. There are those who are predicting a most serious situation and the anxiety in many quarters is now quite out-spoken. Stove and egg are still the short sizes with the companies, but deliveries of any kind are exasperatingly slow.

Wholesale quotations are about as follows:

Clearfields, f.o.b. mine	$1.10@1.35
Somersets f.o.b. mine	1.15@1.35
Somersets, f.o.b. Philadelphia	2.40@2.60
Clearfields, f.o.b. Philadelphia	2.35@2.60
Pocahontas, New River f.o.b. Hampton Roads	2.60@2.70
Pocahontas, New River on cars Boston	3.55@3.65
Pocahontas, New River on cars Providence	3.45@3.55
Anthracite stove f.o.b. New York	5.05@5.30

New York

Anthracite—The strong, heavy demand for hard coal still continues at this point with no relief in sight. No stocks are being accumulated, as is normally the case at this period of the year, with the exception of some of the steam grades. The demand for these sizes is rather weak and some companies are acquiring surplus supplies. The car shortage is not being seriously felt here yet, although some operators report that they are unable to get the kind of equipment ordered and are obliged to load in box cars instead of open cars as heretofore.

Prices continue about as follows with the exception of the circular quotations which underwent the customary advance of 10c. per ton the first of this month:

	L.&W.	L.&S.	Circular
Broken	$4.80	$4.75	$4.85
Egg and stove	5.05	5.00	5.10
Chestnut	5.20	5.15	5.35
Pea	3.50	3.45	....
Buckwheat	2.75	2.45	....
Rice	2.25	1.95	....
Barley	1.75	1.70	....

Bituminous—The soft-coal market continues quiet and about normal for this period of the year. There are reports of a labor shortage at the mines which is interfering with operations, particularly in the coke fields. The car shortage is more noticeable in this branch than in anthracite, and while the situation is not serious yet, some companies who do not own their own equipment are experiencing considerable trouble due to the congestion at the railroad centers.

There is a fair amount of contracting going on at average prices, while stocks at South Amboy have increased slightly, but are still only about normal.

We continue quotations as follows, there being no change noticeable during the past week:

West Virginia, steam	$2.35
Ordinary grades, Pennsylvania	2.45
Fair grades, Pennsylvania	2.55@2.65
Good grades, Pennsylvania	2.70@2.75
Best Miller, Pennsylvania	2.95@3.00
Georges Creek	3.15

Pittsburgh, Penn.

Bituminous—The Parker Run Coal & Coke Co. has closed a contract with the McKeesport Tin Plate Co., whose works are located at the junction of the Monongahela and Youghiogheny Rivers, for a supply of coal for five years beginning Aug. 1, the quantity being approximately 100,000 tons annually. The coal will be towed down the Monongahela River from Fairmount. While the price basis involved is not known, it is understood the West Virginia company considerably underbid the Monongahela River coal interests.

The local coal market continues quiet with demand relatively light and prices as badly cut as ever. Regular asking prices on small lots are $1.10 for nut, $1.15 for mine-run, $1.25 for ¾-in. and $1.25 for 1¼-in., but these prices are shaded on any tonnage by 10c. and sometimes more. The corresponding price on slack is 75c., but on account of the particularly large surplus production, offerings at present are at 50c. or less. Prices are f.o.b. mine, Pittsburgh district.

Connellsville Coke—The break in the ranks of the Connellsville coke operators who were holding out for $2.50 for furnace-coke contracts for the second half of the year has not yet led to important results in the market, as the furnaces continue to hold off. The split occurred between the operators and a Pittsburgh brokerage house which controlled a considerable production and had purchased a large tonnage besides. The operators have appointed the Producers' Coke Co.

as sales agent, so that there are now two principal sellers in the field, and as inquiry has been very light, their lowest prices have not developed. It is understood that the asking price of both parties is $2.25, against $2.50 formerly demanded, and this for both prompt and furnace coke. There is practically no inquiry at the moment, and none is expected before next week, when furnaces which bought for July will be forced into the market again. Foundry coke has not softened since the break in furnace. We quote: Prompt furnace, $2.25; contract furnace, $2.25; prompt foundry, $2.40@2.50; contract foundry, $2.40@2.75, per ton at Connellsville ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending July 13 at 355,108 tons, a decrease of 20,000 tons, and shipments at 4043 cars to Pittsburgh, 5572 cars to points West and 1024 cars to points East, a total of 10,639 cars, a decrease of 600 cars.

Philadelphia, Penn.

Great activity is still manifested in the wholesale branch of the anthracite trade. Almost all operators have orders on hand sufficient to carry them through the month of August and it is understood that stove is in such demand that buyers are in some cases paying a premium for prompt delivery. Mining of coal is at its highest point, it seeming to be impossible to produce fast enough.

Steam sizes seem to be the only handicap to an almost ideal condition. All of these sizes continue to be far in excess of the demand, and the large companies are piling up stocks, rather than move it off at concessions, which the individual operators are not slow to take advantage of, by cutting prices anywhere from 5 to 25c. per ton. Even the local situation is toning up somewhat, the demand extending itself to other sizes than stove, where it has been centralized for some time. Car supply is variable, the collieries being well supplied one day, and short on others.

Baltimore, Md.

There was a slight improvement in this market during the past week, which brought hopes of better times in the future. The demand was more pronounced than for the past three or four weeks, and many operators report that they have received more inquiries than at any time since the strike scare.

The improvement is attributed to the beginning of operations among the various packing plants contiguous to Baltimore. These plants will run continuously for several months, and local operators will likely supply most of them with the necessary fuel.

The business closed during the week, including contract and spot sales, had no material effect on prices. Common gas slack sold from 35 to 40c. during the week, while screened coal brought from 80 to 90c. Run-of-mine was quoted at from 90c. to $1, and bituminous small vein at prices ranging from 90c. to $1.20. Big vein, which is usually shipped under contract, was quoted around $1.50 per ton. The coke market eased off during the week, as compared with the reported activity of the week previous.

Buffalo, N. Y.

There is still some improvement in the bituminous situation and it is now expected to continue indefinitely. As a rule the coal is not paying much profit yet, but another wave of strength ought to put it on its feet again. It is true that there is not much in this trade unless a great amount in handled or the operator is especially well situated.

The Allegheny Valley district is just now taking the lead in the prices it is getting for slack. It is still hard to find anyone who claims to know why, but Valley slack is in good demand at prices that run twice as high as Pan Handle, which is in such excess that it is offered at almost any figure.

The special feature of the trade is the scarcity of cars, which will probably soon extend to anthracite. So far it is the Canadian roads that are failing to keep up with business, but they are running behind so fast that Buffalo will soon be full of coal that cannot be moved any further.

The anthracite situation does not improve. In fact most of the shipping agents confess without hesitation that it is steadily growing worse. Such convenient points as Buffalo get all the coal they need, but outlying districts are likely to suffer next winter and they are apparently waking up to the fact.

Columbus, Ohio

An increased demand for domestic grades and a slight falling off in the Lake tonnage were the chief feature of the coal trade in Ohio during the past week. Dealers are placing orders for the domestic sizes and the movement of these grades has increased at a rapid rate.

There is a good demand for the fancy grades of domestic lump, such as Pocahontas and the rescreened varieties; splints are also good sellers on the local market. Prices on domestic grades are holding up strong.

The steam business is running along steadily. Manufacturing is pretty good in this section and as a result the requirements from large factories are holding up well. The railroad demand is also good and the tonnage increasing. Steam contracts are being renewed at the former prices plus the 5c. added cost of mining.

The Lake trade is letting up a little because of congestion which is appearing at the upper Lake ports. The Lake tonnage from now on will be restricted to the movement off of the docks.

Quotations in Ohio fields are:

Hocking Valley	
Domestic lump	$1 50
¾-in	1 35
Nut	1 10
Mine-run	1 15
Nut, pea and slack	0 40
Coarse slack	0 30
Pittsburgh No. 8	
¾-in	$1 10
Mine-run	1 00
Coarse slack	0 50
Pomeroy Bend	
Domestic lump	$1 50
¾-in	1 35
Nut	1 25
Mine-run	1 15
Nut, pea and slack	0 40
Coarse slack	0 30
Kanawha	
Domestic lump	$1 50
¾-in	1 30
Mine-run	1 10
Nut, pea and slack	0 50
Coarse slack	0 40

Cleveland, Ohio

There has been a little improvement in this market during the past week, particularly in slack, with prices advancing from 5c. to 10c. per ton. This condition is the result of the small amount of coal mined for Lake trade in the past two weeks, and has caused slack to become somewhat scarce. The small shipments of spot coal to this market has materially strengthened prices. Domestic trade has had quite a spurt, most all the dealers taking in good supplies, and this will probably continue.

Lake trade has fallen off very materially because of congestion at the upper Lake docks and it is feared that if the coal is not moved faster there will be a short supply in the Northwest.

Hampton Roads, Va.

As an illustration of the charters reporting, no less than two shippers here were hard pressed this week for coal to fill their orders. Quotations are little discussed, but the general betterment of the market indicates a price level more in line with the local circular. Figures for this month's dumping will be watched with much interest.

The seamen's strike is causing very little trouble here. The effects of it may be felt, however, as during the past week the steamers "El Rio" and "San Jocinto" both put in at Hampton Roads for bunker coal, seemingly to avoid possible trouble at New York.

Birmingham, Ala.

Contracting is on a firm basis, some important municipal and quasi-public enterprises having concluded negotiations during the past few days on a basis better than prevailed last year. Predictions are freely made that more furnaces will go into blast during the remainder of this year, which will divert a large amount

of coal to the coke ovens. This growing certainty is giving strength to the market, and consumers are less disposed to rely upon spot purchases. Dealers are also anxious to specify early deliveries on their contracts up to the limit of their storage capacities, the impression being that conditions indicate a car shortage during the fall and winter.

During the past few days, a bonding company which stood for a contract between the Alabama Consolidated Coal & Iron Co. and a New Orleans consumer, found the coal company in the hands of a receiver and the contract on its hands to look after. The best that the bonding company could do was to place the order at 25c. per ton above that for which the contract provided.

Memphis, Tenn.

The warm weather prevailing throughout this section has resulted in a very slack market, and coal is selling at practically the cost of mining. Consumers are naturally taking advantage and laying in supplies, while these conditions prevail. Mines are running very short time.

Quotations are weak, as follows, f.o.b. mines: Mine-run, 75@85c.; screened lump, $1@1.10; nut, 90c.@$1; screenings 30@40c. Some No. 1 Kentucky lump has been quoted as low as 85c. per ton.

In the western Kentucky and east Tennessee fields, mines are working practically full time. Because of the prohibitive freight rates, screenings from these fields cannot be obtained in the Memphis market. Prices for domestic lump and block for July shipment are $1.80@2, with nut $1.35@1.50. Cahaba coals from Alabama are quoted at $2.85 for July shipment with Carbon Hill, $1.60@1.75.

Stocks generally are quite low, and with the approach of fall an active demand is anticipated. In the retail trade an understanding among the dealers has been effected for maintaining prices, and the prospects in this branch appear quite encouraging.

Nashville, Tenn.

The market for both the west and east Kentucky products is quite dull in all sizes. The dealers are having their customary trouble in getting consumers to lay in supplies, and it will probably be Aug. 1 before the situation is materially changed. Shipments on several large contracts are due to begin at that time, and the movement from then on through the winter will probably be quite heavy.

No indications of a car shortage have yet developed, and operators are hoping that conditions in this respect will not be as bad as last year. Prices generally remain unchanged, with the exception of mine-run, which if anything is weaker; some contracts have been reported let at figures about equal to the cost of production.

Louisville, Ky.

Danger of a shortage in coal at Cincinnati, Memphis, Louisville, Baton Rouge, and many other river points has been temporarily obviated by a rise in the Ohio River, which has allowed the Monongahela River Consolidated Coal & Coke Co. to move a million and a half bushels from Pittsburgh. This coal will be evenly distributed at the various points.

Even the new arrivals will not remove all danger of a shortage of Pittsburgh coal in any of these cities. It will, however, give all about a 30-day supply. The Monongahela was one of the few companies which was prepared for the rise and consequently the only one which was able to take advantage of it. Previous to the higher water, Louisville, with other cities, had very little river coal on hand, the yards being practically cleaned out.

Indianapolis, Ind.

It is evident to the Indiana operators that the car shortage is now developing into a reality and may soon expand into serious proportions, unless relief comes; this is said to have slowed down the production considerably. The charge is made that it is a constructive shortage, because the railroads have not more business than they can actually do, but are permitting their cars to be used as coal warehouses.

A good many steam users dependent on Indiana mines are down to the bottom of their bins and asking for immediate shipments. If there is a continued car shortage lasting through September, there is going to be difficulty to supply all demands.

Detroit, Mich.

Bituminous—The market conditions are rapidly changing. Prices all along the line are advancing and several large contracts have been closed recently. The shippers are very optimistic and there is no coal of any kind on track for spot shipments.

The prices are as follows:

West Virginia	
Domestic lump	$1.50
¾-lump	1.10
Nut	1.10
Mine-run	1.00
Nut, pea and slack	0.85
Pittsburgh, No. 8	
¾-lump	1.20
Mine-run	1.05
Slack	0.55
Hocking	
Mine-run	0.90
Slack	0.40
Pocahontas	
Lump and egg	2.50
Mine-run	1.10

Anthracite—There is very little of this product arriving and local jobbers are unanimous in the opinion that unless immediate relief comes the drain on the soft-coal fields will be unusually heavy this winter. There are very few cargoes passing this port, and it now seems as though the tonnage will fall short of last month.

Coke—There is no material change in the coke market. Prices are firm but more is coming in and the shortage is now being relieved.

Chicago

Prices on some grades have materially strengthened as a result of the beginning of a car shortage which is expected to reach large proportions this fall. It has not only been difficult to get cars, but more difficult to move the coal rapidly.

Smokeless lump and egg is commanding $1.90 to $2, at the mines, although some producing companies are selling through middlemen at $1.85 or even $1.80. These prices will reach $2 Aug. 1, according to predictions now made. There has been a steady movement of coke to furnaces and foundries and an increase in business with retailers. Prices remain firm.

Prevailing prices at Chicago are:

Sullivan County	
4-in. lump	$2.47
Egg	2.37
Mine run	1.99½
Screenings	1.72@1.82
Springfield	
Domestic lump	$2.17@2.32
Steam lump	1.87@1.97
Mine-run	1.82
Screenings	1.57@1.62
Clinton	
Domestic lump	$2.27
Steam lump	2.12
Mine-run	1.92
Screenings	1.67@1.72
Pocahontas and New River	
Mine-run	$3.15
Lump and egg	3.95@4.05

Coke—Prices asked for coke are: Connellsville, $5@5.10; Wise County, $4.25@5; byproduct, egg and stove, $5.75; byproduct, nut, $4.55; gas house, $4.50.

Minneapolis—St. Paul

Coal and railroad men are wondering what can be done to avoid one of the most serious traffic conjestions yet known to the Northwest. Everything is being done to impress the dealer trade with the importance of placing their orders early in August in order to have the first requirements coming forward during that month and before the grain crops move from the West.

As usual the dealer is not much concerned. With a dock capacity at the head of the Lakes of close to 10,000,000 tons, and other ports like Milwaukee and Sheboygan and Green Bay with large dockage facilities, the coal dealer at country points rests securely in his belief that the talk of car shortage is something put up for effect.

Anthracite—The dock men say that not more than a third as much anthracite has been received at the head of the Lakes up to July 1 this year as last year at the same date. That means there is already a shortage of something like

350,000 tons as compared with last year's receipts. Some docks have not received any hard coal, and others only a cargo or two.

St. Louis, Mo.

The first of the month brought a better demand for coal and also a slight increase in prices. The latter part of July, Standard coal got down to 77½c. for lump and 75c. for mine-run. Carterville dropped to $1.10 for lump, $1.05 for egg and 90c. for nut. The operators seemed to be willing to produce and suffer a loss for a few days, in order to keep their working organization together, in anticipation of the business that August would develop.

The prevailing prices are:

Franklin County	
6-in. lump and 3x6 egg	$1.35@1.50
Nut	1.35@1.50
Carterville	
6-in. lump and 3x6 egg	$1.25@1.40
Nut	1.15@1.30
Screenings	0.75@0.80
Mine-run	1.05@1.10
Washed No. 1	1.40@1.50
Washed No. 2	1.30@1.40
Washed No. 3	1.20@1.30
Washed No. 4	1.00@1.10
Washed No. 5	0.80@0.90
Mount Olive	
6-in. lump	$1.40
2-in. lump	1.35
Standard	
6-in. lump	$1.00@1.05
2-in. lump	0.80@0.85
Mine-run	0.75@0.85
Screenings	0.65@0.70
Anthracite	
Chestnut	$7.35
Egg and stove	7.10
Grate	6.85
Smokeless	
Lump	$4.50@4.60
Egg	4.40@4.50

Portland, Ore.

The situation here remains practically unchanged. Storage prices for the summer have not yet been announced and there now seems little probability of such an announcement being made this season. The price today is $10 for Wyoming and Australian coals with poorer grades in proportion.

No vessels have yet been reported as coming here this fall with coal from Australia and it looks now as if the importation will be very limited if any. Considerable Australian coal was carried over from last winter when the demand was light.

San Francisco, Calif.

Weather conditions at this point still continue adverse for an active trade. The large wholesale company, which controls the foreign product here, has recently made an announcement to the dealers that the short ton of 2000 lb. will be used instead of 2240 lb., as heretofore. It was also stated that the price per ton would remain unchanged, so that this means an advance in price of 12 per cent. Dealers have advanced prices to $12 per short ton, as compared with $11.

Tonnage listed from Australia consists of two steamers having a capacity of 9500 tons, and 9 sailing vessels, having approximately, 2000 tons. Only three of these cargoes are due before October, so there will probably be no surplus in these grades.

Prices to the trade are as follows, per short ton:

Wellington (British Columbia)	$8.00
Pelau Main (Australia)	8.50
Rocky Mountain	8.50
Cumberland	12.50

Production and Transportation Statistics

Baltimore & Ohio R.R.

The following is a comparative statement of fuel movement over the B. & O. R.R. and affiliated lines for June 1911-12 in short tons:

	1911	1912
Coal	2,379,859	2,591,318
Coke	292,413	424,009
Total	2,672,272	3,015,327

Total tonnage for the year to June 30 amounted to 30,813,720, as compared with 27,919,374 for the year previous.

The Car Situation

There was an increase of nearly 5000 in the number of idle cars on the railways of this country and Canada on July 18, according to the fortnightly bulletin of the American Railway Association. This increase, paradoxical as it may appear, was probably due to the improvement in the business outlook, and it will be surprising if the next statements do not show a rapidly decreasing supply. At this time last year there were nearly 150,000 idle cars, and the traffic outlook was much poorer then than now.

The following table shows the surplus and shortages of cars of 178 roads on July 18:

	Surplus	Short	Net Surplus
Box	32,393	2,496	29,897
Flat	2,157	1,631	526
Coal, gond. and hopper	15,420	2,074	13,346
Other kinds	25,419	266	25,153
Total	75,389	6,467	68,922

Island Creek Coal Co.

For six months to July 1, Island Creek produced 1,015,000 tons of coal, and management anticipates a production of 2,200,000 tons for the full year. May and June production was about 195,000 tons and had sufficient cars been available this could have easily been 225,000 tons.

Norfolk & Western Ry.

The following is a statement of commercial and company coal shipped from mines on the N. & W. Ry. during June of the current year in short tons:

Field	Commercial	Company
Pocahontas	1,267,556	89,909
Tug River	160,062	37,539
Thacker	171,004	56,226
Kenova	75,952	9,096
Clinch Valley	113,309	8,652
Total	1,787,883	201,423

Foreign Markets

Oriental Markets

Japan—A fair business has been done on this market during the fortnight under review mainly helped by a favorable rate of exchange, but there is not much inquiry at the moment for forward business. Prices locally are steady at quotations, deliveries have been good but stocks on the spot are increasing owing to the numerous arrivals of late. The Japan coal market remains firm.

Manchuria—A fairly good business has also been done on this market and several cargoes are now on the way, while there is also some inquiry forward.

Kaiping—This market has been quiet and new business is scarce, as is only to be expected at this season of the year. This dullness is unfortunately still further accentuated by the unrest which seems to be developing on the political horizon.

Financial Notes

Island Creek Coal Co.—This company is understood to have cash funds on hand amounting to $1,200,000. In addition there should accrue during 1912 a cash balance of $500,000 more, which will remain for property betterments.

Consolidation Coal Co.—This company has declared a regular quarterly dividend of 1½% on its capital stock, payable July 31, to stockholders of record July 25, and also, a quarterly dividend of 1½% on the subscription receipts for stock carrying dividends declared after Jan. 31, 1911, payable July 31, 1912, to holders of record, July 25.

Dominion Iron & Steel Co.—For the fiscal year ended Mar. 31 last, this company exhibited a deficit of $498,701 after common dividends. The other half of the Dominion Steel Corporation, the Dominion Coal Co., however, had a prosperous year, and its net surplus of $670,416 more than made up the loss suffered by its constituent company.

Colorado Fuel & Iron Co.—The fiscal year ended last month is expected to make a new high record in earnings of this company which should show a profit and loss surplus after all charges of $1,600,000 with the possibility of even a better total. The previous best year was 1900, when Colorado Fuel earned a profit and loss balance of $1,522,494.

Hankyang Iron & Steel Co.—This company operating at Hankow, China, is about to increase its productive capacity following an investment of $4,000,000 in the company by Japanese interests. The company owns extensive coal, coke and iron ore lands and is said to have a great advantage over American steel makers on account of its extremely low labor and other costs.

Reading Co.—The best segregation possibilities of this company rest on the control of Jersey Central and the Lehigh & Wilkes-Barre Coal Co. Treatment of the latter similar to that of Lehigh Valley by the formation of a coal sales company might easily be made with capital stock of sales company paying 10% and amounting to $14,172,000, sufficient to give one share to every two shares of Jersey Central.

Prices of Mining Supplies

Current Prevailing Prices of Mining Commodities Compiled as a Convenient Reference for Buyers

THE MARKETS IN GENERAL

Each week sees a larger business transacted than in the week preceding. The railways of the country are making every effort to prepare their lines for the movement of the crops, which this year will be enormous. Bank clearances make new high records each week, and reports of buildings from all over the United States are uniformly optimistic. Manufacturing establishments throughout the length and breadth of the land are straining every effort to turn out their products, and each day the demand becomes more insistent.

The iron and steel industry did not expand as much during July as during the preceding month for the reason that it was impossible to put any more capacity at work with the labor available. Many blast furnaces and steel mills have been obliged to close down temporarily in order that necessary repairs be made. These conditions do not prevail in the United States alone, but throughout the world there is more business being transacted than ever before. Conditions in Germany, Great Britain and France are more satisfactory than in a number of years. So great has been the demand for cargo space on trans-atlantic liners and tramp steamers, that freight rates have been more than doubled.

LABOR

Every man who wishes to work and is able to, can find employment, in most cases at his own trade. The urgent request for laborers in the harvest fields has induced many of those in small towns to leave their occupations for the time being.

In New York, agents for the steel mills of Pennsylvania, representatives from the mines and contractors, practically meet the incoming steamers at Ellis Island and offer free transportation to laborers willing to work. In the first half of 1912, 580,000 immigrants arrived at American ports. This is disappointing, for in the corresponding period of 1910 there were 694,000 aliens; in 1909, 638,000, but it only reflects better industrial conditions abroad. In New York, rough labor is paid $2 to $2.25 per day, but especially good workmen can readily command $2.50 and $2.75. The poorer classes of labor from the North of Europe receive slightly more than a month ago, or $1.85.

IRON AND STEEL PRODUCTS

Manufacturers in this country have orders on their books for a tonnage sufficient to keep them running until the beginning of another year, even if they did not take another order. The mills are so congested that structural material cannot be shipped for 12 or 14 weeks after specifications have been received, and a like condition prevails in the market for plates. In the lighter lines, things are almost as unsatisfactory; there is an enormous demand notwithstanding recent advances in prices. Labor conditions at the mills are slightly better than a month ago, but the tonnage produced in July will not equal that of June. The abnormally high wages paid have attracted many from their ordinary lines of employment into the steel mills.

Advances during the month include higher prices for the larger sizes of steel pipe, an advance for cast-iron pipe, somewhat higher prices for old material, with an advance of $1 per ton in reinforcing bars, further advances in nails and wire, with a prospect of a rather general advance in the more highly finished forms of steel.

IRON AND STEEL

Old Material—The market is firmer and the demand has been considerably more active. A notable sale was 10,000 tons of heavy-melting steel scrap, which sold at an equivalent to $11.75 New York. This, however, is a higher price than most consumers will pay. Quotations per gross ton f.o.b. New York are as follows:

Heavy-melting steel scrap..	$11.25@11.50
No. 1 railroad wrought.....	13.25@13.50
Pipes and flues.....	10.00@10.25
Cast borings.....	7.25@ 7.50
Machinery cast, broken up .	11.00@11.25
Stove plate.....	8.25@ 8.50
Malleable castings.....	10.00@10.50
Wrought turnings.....	8.25@ 8.50

In Chicago the market is not as strong as last month, due largely to the large quantity of scrap being offered by the railroads. Quotations are as follows:

	Per gross ton
Heavy, melting steel scrap..	$11.50 @12.00
	Per net ton
No. 1 railroad wrought.....	11.75@12.25
No. 2 railroad wrought.....	11.25@11.75
Machine-shop turnings.....	7.00@ 7.25
No. 1 cast scrap.....	11.75@12.25
Pipes and flues.....	8.75@ 9.25
Agricultural malleable.....	10.50@11.00
Railroad malleable.....	11.75@12.25

In Pittsburgh conditions are not as satisfactory as they might be to the sellers of scrap, as a large quantity of material is coming on the market, and during the hot weather the mills are not able to take care of as much scrap as in other seasons. Prices are slightly easier and are quoted as follows f.o.b. Pittsburgh:

Rerolling rails.....	$14.50@14.75
No. 1 cast scrap.....	13.25@13.50
Heavy-melting steel scrap..	13.50@13.75
Old car wheels.....	13.75@14.00
Machine-shop turnings.....	10.75@11.00
Stove plate.....	9.00@ 9.50
Grate bars.....	9.75@10.00

Roofing, Corrugated—Prices have been advanced $1 per ton for black sheets and $2 per ton for galvanized sheets. The extras for corrugation are 5c. for 100 lb. for 2-, 2½- and 3-in. corrugations; painting, gages from 25 to 28, 15c. per 100 lb.; gages 19 to 24, 10c. per 100 lb.; heavier gages, 5c. per 100 lb. The following table gives the price of flat sheets in carload lots, f.o.b. the Pittsburgh district, which includes the mentioned advance of $1 per ton on black sheets:

	Cents per lb.	
	Black	Galvanized
Nos. 10 and 11.....	1.65	2.10
Nos. 12, 13 and 14.....	1.70	2.20
Nos. 15, 16 and 17.....	1.85	2.35
Nos. 18, 19, 20 and 21...	1.85	2.50
No. 22.....	1.80	2.50
Nos. 23 and 24.....	1.90	2.60
Nos. 25 and 26.....	1.95	2.80
No. 27.....	2.00	2.95
No. 28.....	2.00	3.10
No. 29.....	2.05	3.20
No. 30.....	2.15	3.40

In Chicago store prices are as follows:

	Cents per lb.	
	Black	Galvanized
No. 10.....	2.05	
No. 12.....	2.05	2.65
No. 14.....	2.05	
No. 16.....	2.20	2.70
Nos. 18 to 22	2.20	2.85
No. 24.....	2.25	2.95
No. 26.....	2.30	3.15
No. 28.....	2.35	3.55

Cast-iron Pipe—Quotations have advanced, due to higher prices of pig iron and a better demand. The foundries in the Birmingham district have practically all the business they can take care of for this season's shipment, and are not anxious to make contracts for future delivery. Quotations per net ton of 2000 lb. are as follows f.o.b. the points named:

Chicago, 4 in., $27.50; 6- to 12-in., $26; larger sizes, $25.

New York, 6-in., $22 to $23.

Birmingham, Ala., 4-in., $24; 6- to 8-in., $22; 10-in. and over, $21.

Steel Rails—The demand is large, particularly for light rails for industrial uses and mines. In the Pittsburgh district, deliveries are delayed on these kind of rails from three to four weeks. In the Chicago district, the leading Western railways have not purchased the tonnage they were expected to, and in consequence it is doubtful that they will secure all the rails wanted for this year's delivery.

Quotations f.o.b. Pittsburgh are as follows: Standard sections, 50 to 100 lb. per yd., 1.25c. per lb.; 40 to 50 lb. 1.21c.; 12 lb., 1.25c. Relaying rails in standard sections are $23.50 to $24, and light rails, $21 to $23 f.o.b. Chicago. In New York relaying rails are $21 to $23. In Chicago carload lots of light rails are quoted as follows: 25 to 45 lb., 1.20 to 1.25c.; 15 to 20 lb., 1.25 to 1.30c.; 12 lb., 1.30 to 1.35c.; 8 lb., 1.35 to 1.45c.

Steel Mine Timbers—An advance will probably be made in the very near future. The present price is 1.30c. per lb., f.o.b. Pittsburgh.

Track Supplies—Business has improved materially and many railroads are in urgent need of more spikes. Quotations on spikes have been advanced and in Pittsburgh they are now held at 1.60 to 1.65c. base; angle bars are unchanged at 1.50c., and track bolts at 2 to 2.20c. In Chicago angle bars are 1.50c.; track bolts with square nuts, 1.95 to 2.05c. Spikes are higher at 1.60 to 1.65c. All these prices are per lb.

Bars, Concrete Reinforcing—The makers of steel bars advanced quotations $1 per ton July 29. Consumers who did not place orders for bars in the early spring are now seriously handicapped by their inability to secure any kind of prompt shipments. Even those consumers who purchased several weeks ago, and at much lower prices, have had difficulty in obtaining supplies as desired. The following prices are for mill shipments f.o.b. Pittsburgh:

	Cents per lb.
¾-in. and larger.....	1.30@1.40
⅝-in.	1.35@1.45
½-in.	1.40@1.50
⅜-in.	1.50@1.60
¼-in.	1.80@1.90

Wire Rope—Prices are without change. The discount to the larger trade is 42½ and 5% from list, for galvanized, and 50 and 5% for bright. See page 33 of our issue of July 6 for table of prices.

Merchant Pipe—Prices were advanced on the large-sized pipe about $1 per ton. This applies to pipe 7- to 12-in., lap welded. Discounts on steel pipe, f.o.b. mill, Pittsburgh, are as follows:

	Black	Galvanized
2- to 1½-in. butt welded...	80%	72%
2-in. lap welded.....	78%	71%
2½- to 4-in. lap welded....	80%	73%
4½- to 6-in. lap welded....	79%	71%
7- to 12-in. lap welded....	77%	67%

For prices on sizes below 7 in., see page 33 of our issue of July 6. Prices on pipe above 7 in. are as follows per foot, net, after discount:

	Steel pipe in cents per ft. f.o.b. mill	
	Black	Galvanized
7-in.	54.00	78.00
8-in.	57.00	82.00
9-in.	78.00	112.00
10-in.	81.00	115.00
11-in.	104.00	149.00
12-in.	113.00	162.00

Nails—Prices of wire nails were advanced $1 per ton July 20. This advance has been anticipated for some time in the trade and for several weeks the orders received by the mills were larger than usual. Business all during the year has been very satisfactory, but for the last month it has been unusual. Pittsburgh quotations for carload lots are $1.70 to retail merchants and $1.65 to jobbers. For less than carload lots to retailers the quotation is $1.80. Cut nails in Pittsburgh are $1.60. From jobber's store, New York wire nails are quoted at $1.85 to $1.90 and cut nails at $1.80 to $1.85. These prices are per keg of 100 lb.

Merchant Shapes—The demand is large and stocks are by no means well assorted. The congested condition at the mills has resulted in many consumers buying from store which accounts for the depleted stocks.

Quotations from store, New York, are as follows:

	Cents per lb.
Refined iron:	
1- to 1⅞-in. round and square... 1½- to 4-in.x⅜- to 1-in..... 1½ to 4-in.x¼- to 5-in.....	1.80
Rods:	
⅝- and ⅞-in. round and square.	1.90
Angles:	
3x¼-in. and larger	1.90
3x⅛-in. and ⅜-in.	2.30
1½ to 2½x⅛-in.	2.05
1½ to 2¾x⅜-in. and thicker	1.95
1 to 1¼x⅜-in.	2.05
1 to 1¼x⅛-in.	2.10
⅞x⅛-in.	2.20
¾x⅛-in.	2.25
⅝x⅛-in.	3.45
Tees:	
1-in.	2.35
1¼-in.	2.20
1½ to 2½x¼-in.	2.00
1½ to 2½x⅜-in.	2.00
3-in. and larger	1.95
Beams	1.90
Channels, 3-in. and larger	1.85
Bands, 1½ to 6x⅛-in. to No. 3	2.10
"Burden's Best" iron, base price	3.15
Burden's "H. B. & S." iron, base price	2.95
Norway bars	3.60
Bessemer machinery	1.70

Lag Screws—The prices of lag screws are unchanged, and cone-point lag screws are sold at a base discount of 80% from list. See our issue of July 6, page 34, for table of net prices.

Spiral Riveted Pipe—Prices are without change. Quotations given on page 34 of our issue of July 6 are f.o.b. factory, freight equalized with New York, being figured at a discount of 50, 10 and 10% from list. These are for orders amounting to approximately $250. For large orders, prices are cheaper by 12½ to 20%.

Piling, Sheet Steel—Business is fairly active and manufacturers are looking for considerable demand from the subway builders in New York. Prices continue without change at 1.40c. per lb. f.o.b. Pittsburgh.

Wire—Effective July 20 prices were advanced $1 per ton. Business is large and fairly satisfactory to manufacturers. For fence wire in less than carload lots f.o.b. Pittsburgh, Nos. 0 to 9, annealed, quotations are $1.60; galvanized, $1.90. Barbed wire from Pittsburgh is $1.70 for the painted and $2 for the galvanized.

In Chicago painted barbed wire is $1.83 and galvanized $2.13. All these prices are per 100 lb.

Bolts—The market continues strong and although it was expected that an advance would take place none has as yet occurred. Consumers are buying freely and allowing stocks to accumulate for it is believed that prices must shortly advance. Prices are unchanged, common carriage bolts being quoted at 75% and 10% discounts in bolts ⅜x6 in. and smaller. On larger and longer bolts, the discount is 70 and 10%.

MILL SUPPLIES

Shafting—The erection of new factories all over the country is calling for a great deal of this material, in addition to that which the automobile makers are using. Discounts are as follows: 65% off list for carload lots and 60% for less than carload lots. On carload lots delivery is made in base territories.

Belting—Leather prices are advancing, and it would not seem as though the quotation for belting would remain at this level much longer.

Discounts on leather belting are as follows: Extra heavy, 50 to 50 and 5%; heavy, 50 and 10 and 5 to 60%; medium, 60 and 10 to 60 and 10 and 5%; light, 60 and 10 and 10 to 70%; Standard, 70 to 70 and 10%.

The discounts applying to rubber belting are unchanged, best grades being held at 40 and 10% to 50%. Standard, 50 and 10% to 60%. Competitive grades are 60, 10 and 10% to 70%.

The price of rubber belting is unchanged from last month and the net price may be found on page 34 of the issue of July 6.

The net prices per foot of leather belting figured at the above discounts are as follows:

LEATHER BELTING, NET PRICE PER FOOT

Width, inches	Extra heavy	Heavy	Light
1	$0.11	$0.10	$0.08
1½	.17	.14	.11
2	.23	.19	.15
2½	.28	.24	.19
3	.34	.29	.23
3½	.40	.34	.27
4	.46	.38	.31
5	.57	.48	.38
6	.68	.58	.46
7	.80	.67	.54
8	.91	.77	.61
9	1.03	.86	.69
10	1.14	.96	.77
11	1.21	1.06	.84
12	1.37	1.15	.92

Fire Hose—Prices of hose are unchanged. The standard grade of underwriters' cotton rubber-lined hose, 2-in. diameter warranted, 350 lb. pressure, is sold in 50-ft. lengths complete with couplings at 65c. per ft. Common hose, 2½-in. diameter, tested to 200 lb. pressure, is 35c. per ft.

Cotton Waste—Prices are as follows in bales of 100 to 500 lb.: No. 1 white picked cotton waste, 9¼c. per lb.; No. 3, 7¼c.; No. 1 colored, 5c.; No. 3 colored, 4¼c.

Lubricating Oils—Quotations continue without change, the following figures being named for 5-bbl. lots:

	Cents per gal.
*Cylinder, dark	20@27
*Cylinder, steam, refined	14@22
Neutral oils, filtered:	
Stainless white, 32 to 34 gravity	28@29
Lemons, 33 to 34 gravity	17@19
Dark, 32 gravity	15@18
Crank case oil	15@17

*Prices are according to test.

Packing—Prices are unchanged from last month, asbestos wick and rope being quoted at 13c.; sheet rubber, 11@13c.; pure gum rubber, 40@45c.; red sheet, 40@50c. Cotton packing can be had at 16@25c.; jute at 3¼@3½c., and Russian at 9 to 10c.

High-speed Steel—Prices continue without change, ranging from 50@70c. per lb.

MISCELLANEOUS

Petroleum Products—The continued rapid advance in the price of gasoline has excited more than ordinary comment; early in the year gasoline in New York could be had at 11¾c., but since that time there has been a steady advance almost every month of from one to two cents per gallon, and the present price in New York is 19¾c. Where competition is severe these prices are much lower, and in some cases gasoline is sold at around 12c. per gal. in wholesale lots. Petroleum from tank wagon, delivered, is unchanged at 8c. per gal. No change has been made in the price paid for crude oil at the wells by the leading buyer.

Paints—Business has been very active and there would undoubtedly have been an advance in the better grades of paints if not for the almost assured fact that linseed oil will be cheaper next year. Crude pig lead has advanced; but white lead in oil is unchanged. The crop of flaxseed promises to be large and a steady decline in the price of linseed oil may be expected from now on; it now sells at around 73c. per gal. in 5-bbl. lots, f.o.b. New York. Spirits of turpentine is likewise cheaper at 44c. in Savannah and 46c. in New York. White lead in oil in 100-, 250- and 500-lb. kegs is 7c. per lb. Red lead and litharge in lots of 500 lb. and over are unchanged at 7c.

Copper Wire—The demand is enormous, the leading manufacturers of electrical supplies having large orders on their books with the assurance that others will materialize in the near future. The base price of copper wire is now 19c. per lb., which is 1½c. per lb. over the price of raw material.

Aluminum Wire—The price is unchanged at 31c. base.

Insulators—Prices are without change. Glass insulators in lots of more than 1000 and less than 10,000 are sold at the following prices per 1000: Double petticoats, 20 oz., $33; Western Union, $30.25; No. 2 cable, $53.90; No. 4 cable, $210; Muncie type, 7-in., $236.50; No. 3 triple petticoat, 4½-in., $90.75.

Telegraph Wire—For lots of fair size, the wire measured in Birmingham wire gage, the prices in cents, per lb., are as follows: "Extra Best Best," Nos. 6 to 9, 4⅜c.; Nos. 10 and 11, 4½c.; No. 12, 4⅝c.; No. 14, 5⅛c. "Best Best," Nos. 6 to 9, 3½c.; Nos. 10 and 11, 3⅝c.; No. 12, 3½c.; No. 14, 4c. Actual freight is allowed from Trenton, N. J., where it does not exceed 25c. per 100 lb.

Rope—The demand is large, and owing to the excellent crop outlook with a demand for binder twine which cannot be supplied, there is little doubt but that the cheaper grades will advance. Quotations for manila rope are 8½ to 8¾c. per lb. for the best grade; 7½ to 7¾c. for second grade and 6½ to 7c. for hardware grade.

Roofing Paper—As a result of the large demand from all classes of consumers, shipments are not made as promptly as they were in the spring. Manufacturers have depleted their stocks in warehouse and are now shipping directly from manufactured stock.

Quotations in New York are as follows:

	Per Roll of 500 Sq.Ft.
Rosin sized sheathing, 20 lb.	28c.
Rosin sized sheathing, 30 lb.	43c.
Rosin sized sheathing, 40 lb.	58c.

ROOFING, RUBBER

	Per Roll of 108 Sq.Ft.
1 ply—35 lb.	$0.90
2 ply—45 lb.	1.10
3 ply—55 lb.	1.30

Tarred felt is $1.45 per 100 lb. in 1, 2 and 3 ply. Slaters' felt is 60c. per roll.

Explosives—Owing to the dissolution of the leading manufacturer of powder, prices are most uneven. Blasting powder, soda grade, is sold at $1.20@1.40 per keg of 25 lb. in 5-ton lots.

Exploders, per hundred, are sold at the following prices: 4 ft., $3.60; 6 ft., $4.10; 8 ft., $4.60; 10 ft., $5.10; 12 ft., $5.60; 16 ft., $6.60; 20 ft., $7.50; 26 ft., $9.40; 30 ft., $12; 36 ft., $14.60.

Caps in lots of 10,000 are $7@8 per thousand.

Blasting machines for 10 holes are $12; 25 holes, $20; 50 holes, $40; 100 holes, $60.

Portland Cement—An advance of 10c. per bbl. was made by the leading producers of portland cement in the Lehigh Valley district July 20. The New York price for cement in bags is now $1.40, which is equivalent to $1.10 at the mills. Practically all the smaller mills outside of the Lehigh Valley district are well sold up for this year's delivery and in the West it is difficult to secure cement with any degree of promptness.

As stated, in New York cement is sold at $1.40, with an allowance of 40c. for bags returned. The freight rate from the Lehigh Valley district is about 30c.

Brattice Cloth—Sellers of this material report a demand for prompt shipments of unusual magnitude. Consumers earlier in the year delayed making purchases for two reasons, one being the high cost, and the other the enforced idleness at many of the mines. Prices continue unchanged, but they are high in comparison with the quotations of recent years. Although the jute crop will probably be large, the demand for brattice cloth and bagging, also made of jute, is so large that little relief in the way of lower prices is expected.

Index of Coal Literature

Monthly list of the world's best articles on coal and coal mining

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Am. Lab. Legis. Rev. = American Labor Legislation Revue.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Austral. Min. Stand. = Australian Mining Standard.
Berg-Huttenmänn. Rdsch. = Berg- und Huttenmännische Rundschau.
Bull. Am. Inst. Min. Eng. = Bulletin American Institute of Mining Engineers.
Can. Eng. = Canadian Engineer.
Can. Min. Jl. = Canadian Mining Journal.
Chem. Eng. = Chemical Engineer.
Coll. Guard. = Colliery Guardian.
Comp.-Air Mag. = Compressed Air Magazine.
Compt. Rendus Acad. Sc. = Comptes Rendus de l'Académie des Sciences.
El. Eng. = Electrical Engineering.
El. Jl. = Electrical Journal.
El. Kraftbetr. = Electrische Kraftbetriebe und Bahnen.
Eng. Contract. = Engineering Contractor.
Eng. Min. Jl. = Engineering and Mining Journal.
Eng. News = Engineering News.
Fördertechnik = Die Fördertechnik.
Geol. Mag. = Geological Magazine.
Handel und Ind. = Handel und Industrie.
Int. Mar. Eng. = International Marine Engineering.
Inst. Min. Metal. = Institute of Mining and Metallurgy.
Int. Volkswirt = Internationaler Volkswirt.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Ind. Engin. Chem. = Journal of Industrial and Engineering Chemistry.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. S. Afr. Inst. Eng. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Lumière El. = Lumière Electrique.
Min. Eng. = Mining Engineer.
Mines Minerals = Mines and Minerals.
Min. Sc. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mon. Ind. Gaz. = Moniteur de l'Industrie du Gazet de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift fur Berg und Hüttenwesen.
Portefeuille Econ. Machines = Portefeuille économique des machines.
Proc. Acad. Pol. Sc. N. Y. = Proceedings of Academy of Political Science, New York.
Proc. Am. Inst. El. Eng. = Proceedings of American Institute of Electrical Engineers.
Proc. S. Wales Inst. Eng. = Proceedings of South Wales Institute of Engineers.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Saarbrucker Berg. Kal. = Saarbrucker Bergmanns Kalendar.
S. Afr. Min. Jl. = South African Mining Journal.
Soz.-Technik = Sozial-Technik.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Tech. Rdsch. = Technische Rundschau.
Techn. Wirtsch. = Technik und Wirtschaft.
Tekn. Tidskrift = Teknisk Tidskrift.
Trans. Inst. Min. Eng. = Transactions Institute of Mining Engineers.
Trans. Min. Inst. Scot. = Transactions of Mining Institute of Scotland.
Trans. Inst. Min. Eng. = Transactions of the Institute of Mining Engineers.
Trans. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. Damptkessel-Betr. = Zeitschrift für Dampfkessel und Maschinenbetrieb.
Z. El. Mach. = Zeitschrift für Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

I—GENERAL

Coal Cathechism. W. J. Nicolls. 5th ed. 16 mo. Phil., Jacobs, 1912.

Directory of Coal Mines in U. S. A. and Canada. Yearbook. 1912 Edition. Chicago, 1912, Black Diamond Publ. Co.

Mining Accounts. Elliott, E. "Incorp. Accts. Jl." 1912. 6, pp. 247-52.

The Principles of Expropriation according to General Mining Laws. (Die Grundlagen der Enteignung nach dem allgemeinan Berggesetz.) H. Gottschalk. "Glueckauf." vol. 48. 19. pp. 750-54. 75c

Coal and Coal Mining in Spitzbergen. A. Vdhaug. "Iron Coal Trade Rev." vol. 84. 2313. p. 1040. 5 fig. (A description of typical coal seams and future prospects.) 30c.

Alaskan Coal Problems. (U. S. Interior Dep. Mines Bur.) 1912. 32 pp. map.

Transvaal Coal vs. Natal Coal. Hoy. "S. Afr. Min. Jl." 1912. 18. pp. 420. 50c.

The English Minimum Wages Act for Coal Miners. (Englishes Gesetz betr. Minimallohn beim Kohlenbergbau). "Soz Rdsch." 1912. II. 4, pp. 159-65. 40c.

The English Coal Strike. (Den engilkak kolstreiken). "Tekn. Tidsskr." 1912. 37. pp. 153-5. 4 fig. (Output of Coal Production Sweden Import. Proposed means for getting independent from the English Coal Trade.) 50c.

The Minimum Wage in British Coal Mining. (Der Mindestlohn im britischen Steinkohlenbergbau.) Juengst. "Glueckauf." vol. 49, 19, pp.759-64. (Minimum Wage Law of March 1912.) 75c.

Awards under the Coal Mines Minimum Wage Act, 1912. Bd. Trade Lab. Gaz. 1912. 5, pp. 166-70. 15c.

Nine Years of the Anthracite Conciliation Board. S. M. Harrison. "Survey." vol. 28. 3. pp. 143-51.

The Police in the Service of the Mining Capitalists. (Die Polizei im Solde des Grubenkapitals.) E. Kuttner. "D. Ind. Beamten-Ztg." 1912. 13. pp. 133-5.

Statistics of the Mineral Industry in the United States. (Statistique de l'industrie minerale des Etats-Unis en 1909. "Ann. Mines." vol. 1. 1912. 4. pp. 377-8.

Imports and Exports of Germany, including Fuel. (Ein-und Ausfhur des deutschen Reiches and Baumaterialien). "D. Kohlen Ztg." 1912. pp. 66-7. 40c.

Germany's Coal Fields and Visible Coal Supply. (Deutschlands Steinkohlenfelder und Steinkohlenvorraete) "Stein Braunkohle" vol. 4. 10. pp. 119-20. (Review of Dr. Fritz Frech's work on this subject.) 35c.

Germany's Coal Fields and Visible Coal Supply. A Review of Recent Researches and Experiences. (Deutschlands Steinkohlenfelder u. Steinkohlenvorraete, ein kurzgefasster Ueberlick der enuesten Erfahren.) F. Frech, Lex. 8vo. 165 pp. 18 ill. 7 maps. Stuttgart, E. Schweizerbart, 1912. 19sh.

Reports of the Mine Owners' Association of Austria for 1911. (Bericht des Vorstandes des Zentralvereines der Bergwerksbesitzer Oesterreichs.) "Montan. Rdschau" 1912. pp. 501-16. (Statistics of coal, lignite and briquet production, imports and exports.) 30c.

Coal Imports and Exports of Austria-Hungary 1911. (Kohlen Ein-und Ausfuhr Oesterreich-Ungarns in Jahre 1911) "Nachr. Handel" 1912. 22. p. 3. 70c.

Development of the Belgian Coal Mining Industry. (Die Entwicklung des belgischen Kohlenbergbaus) "D. Bergwerksztg." 1912. June 8. Section 6. (Production, prices etc., since 1850.) 40c.

Coal Production of Bulgaria, 1901(1911. (Die Foerderung von Steinkohlen in Bulgarien, 1901-1911) "Nachr Handel". 1912. 15. p. 3. 70c.

Coal Imports and Exports of the Netherlands 1911. (Steinkohlen Ein-und Ausfuhr der Niederlands 1911) "Nachr. Handel" 1912. 22. p. 4. 70c.

The Grouping of the Coal-Dealers' Unions according to the Centres of Production. (Zur Gruppierung der Kohlen haendlervereine nach den hauptsaechlichsten Bezugsrevieren.) O. Polster. "Volksw. Bl." 1912. 8. pp. 104-5.

Coal and the London Coal Trade. H. B. Dale. 8vo. Ldn. Author. 1912. 6s.

The Fuel Trade in France in 1911. (Le Commerce des combustibles en France en 1911) E. Didier. "Rev. Noire." 15. 1912. 385 p. 120-1; 389 pp. 169-71. 50c.

Why your Coal Bill is so high. G. H Cushing. "Tech. World Mag." vol. 17, 1. pp. 62-71.

II—GEOLOGY

Geography in the Development of the Alaska Coal Deposits. A. H. Brooks. "Ann. Assoc. Am. Geogr." vol. 1. pp. 85-94. (Discussion of the dominant position of Alaska to supply the Pacific Coast Coal Markets.)

The Ore and Coal Bearing Formation of the Yukon. "Canad. Min. Jl." vol. 33. 12. pp. 407-8. 1 tab. (Coal Resources and Geology.)

Upper Skeena, B. C., Coal Resources. Mining Developments around Hazelton. "Brit. Columb. Min. Rec." vol. 17. 9. pp. 278-9. 14 fig. 1 map.

The Roslyn, Washington, Coal Field. J. Daniels. "Coal Age" vol. 1. 33. pp. 1064-6. 7 fig. (This is one of the most important Pacific Coal Fields; the geology is discussed as well as the methods of development in use, the difficulties encountered, the novel rope haulage shafts, rock tunnels and slopes.)

The Formation of the Brown-Coal Deposits between Altenburg and Weissenfels. (Die Entstehung der Braun kohlenlager zwischen Altenburg and Weissenfels.) F. Raefler "Braunkohle." vol. 11. 7. 1912. pp. 99-102. 2 ill. 20c.

The Subsudetic Brown-Coal Formation in the River-Basin of the Middle Course of the Glatzer Neisse. (Die subsuedtische Braunkohlenformation im Flussgebiet des Mittellaufes der Glatzer Neisse). F. Friedensburg Dissertation 8vo. 60pp. Breslau.

On the Meteorology of the Pit. (Zur Meteorologie der Kohlengrube.) "Glueckauf." vol. 48. 18. pp. 714-7. 75c.

Surveyor's Backsight Sconce. Fischer, F. L. "Eng. Min. Jl." vol. 93. 23. p. 1125. 3 fig. (The sconce described was designed to throw a light on the backsight in order that the plumb line might readily be seen through the instrument when surveying underground.)

III—MINING TECHNOLOGY

Sapphire Cutting Tools. H. L. Thompson. "Engin. Mag." vol. 43. 1. pp. 105-6. (The application of this medium in place of diamond for abrasives.)

Electric Rock Hammer Drill built by Otto Pueschel in Grosslichterfelde near Berlin. (Elektrischer Gesteinsbohrhammer der Maschinenfabrik Otto Pueschel in Grosslichterfelde near Berlin.) "Z. Ver D. Ing." 1912. 19. pp. 773-4. 1 fig. 2 ill. (Description of the hammer drill and some of the work done with it.) 50c.

A Comparison between Portable Electric Drills and Portable Air Drills. A. G. Popeke. "El. Jl." vol. 9. 6. pp. 535-9. 6 fig. 2 tab. (Where both compressed air and electric power are available consideration should be given to the question whether to use portable electric or air tools. Data are given of interest in this relation.)

Testing Air Consumption of Drills. "Comp. Air Mag." vol. 17. 6. pp. 6454-5. 1 fig. 1 tab. (A description of the apparatus employed and method of arranging the data.)

Design and Maintenance of Rock Drill

Bits. W. Blackburn. "Comp. Air Mag." vol. 17. 6. pp. 6451-4. 2 fig.

Turbo Blowers and Turbo Compressors. "Iron Coal Trade Rev." vol. 84. 2308. pp. 874-5. 10 fig. (Particulars are given of the trials of one right and one left hand rotary blower, designed for fixed quantity of 19,500 cf. per min. at varying pressures of from 2 in. to 6 in. Water gauge.) 30c.

Westinghouse Turbo Blowers and Compressors. "Colliery Guard." vol. 103. 2786. pp. 1289-90. 6 fig. 15c.

Gasoline Motors in Coal Mines. A. J. King. "Coal Age." vol. 1. 37. pp. 1217-8. (Where gasoline is used, increased ventilation is recommended. It effects economy by making a power plant unnecessary but the formation of carbon monoxide and the danger of premature explosion of gasoline are objections.)

IV—WORKING OF MINERALS

The Federal Valley Field in Ohio. A. J. Shurick. "Coal Age." vol. 1. 38. pp. 1236-8. 3 fig. (A description of the working of a seam which occurs under conditions especially favorable to economical mining.

The Roslyn Coal Field, Washington. J. Daniels. "Coal Age." vol. 1. 35. pp. 1130-2. 3 figs.1 plate. (The article discusses the method of working; the room and pillar system is used exclusively and the coal is handled in the rooms by both chutes and gravity planes; some notes on costs are added.)

Experiments and Improvements in Mining in Russia during 1910. (Versuche und Verbesserungen beim Bergwerkshetriebe in Preussen waehrend des Jahres 1910.) "Kohle Erz." 1912. 20. p. 498-506. 4 fig. 21. pp. 535-44. 10 fig. 50c.

Notes on Mining in India. "Coal Age." vol. 1. 37. pp. 1212-3 1 tab. (In coal mining the dips are found predominantly heavy and thick seams. 35% of the underground workers are women. The death rate one-half that of the United States coal mine industry.)

Coal Mine Accidents in West Virginia. D. Victor. "Coal Age." vol. 1. 36. p. 1176. (The accidents from mine cars are largely due to the lack of clearance between the sideboards and the rib. More than half the coal in West Virginia was extracted from mines where no fatalities occurred.)

West Virginia Mining Accidents. F. C. Cornet. "Coal Age." vol. 1. 35. pp. 1132-4. (Some comprehensive data regarding accidents in the West Virginia mines; the author takes the view that safety can only be obtained by constant and close supervision. As compared with the Belgian mines he considers the West Virginian the safer.)

Mine Accidents and Their Prevention. J. Dague and S. J. Phillips. 8vo. 69 p. 200 illus. Scranton, Pa., D. L. & W. R.R. Co., 1912. 35.

Prevention of Accidents in Coal and Metal Mines in New Zealand. "Colliery Guard." vol. 103. 2687. pp. 1292-3. 3 tab. 15c.

V—BORING, SHAFT SINKING AND TUNNELING

Churn Drilling for Great Depths. (Ueber stossendes Tiefbohren auf grosse Teufen) V. Gebhardt "Kohle Erz." 1912. p. 555. 50c.

Proving Coal in Boreholes. (Die Nachweisung von Steinkohlen-Vorkommen in Bohrloechern.) Herm. Cramen. "Kohle Erz." 17. 1912. pp. 386-90. 50c.

On a few Novel Shaft-Sinking Methods. (Eineges euber neuere Schachtabteuf Methoden.) "Wasser-Wegebau-Z." vol. 10. 1912. 4. p. 43. (The Kind-Chaudron Process; petrifaction process.

Shaft-Sinking by the Petrifaction Process. (Schachtabteufen nach dem Versteinerungsverfahren.) "Allg. oesterr. chem. Ztg." vol. 30. 9. pp. 103-4. 40c.

Comparison between the Most Important Methods of Shaft Sinking (Die wichtigsten Schachtabteufungsverfahren im Vergleich miteinander) Stegemann. "Techn. Blaetter" 1912. p. 169. 40c.

Improved Ferro Concrete Shaft Lining. C. Meuskens. "Iron Coal Tr. Rev." vol. 85. 2314. 5 pp. 9 fig. 30c.

The Electric Ignition in Shaft Sinking. (Die elektrische Zuendung beim Schachtabteufen.) Lisse. "Glueckauf." vol. 38. 19. p. 748-50. 2 ill. 3 fig. 75c.

Difficulties in Shaft Sinking. (Schwierigkeiten beim Schachtabteufen) Diancourt. "Bergbau." vol. 25. 17. p. 257-40. 50c.

VI—BLASTING, EXPLOSIVES

"Midriaukit" A Substitute for Dynamite. An Important Advance in the Field of Explosives. "Miedriankit" ein Ersatz fur Dynamit. Ein bedeutungsvoller Fortschritt auf dem Gebiete der Sprengstofftechnik.) Ebeling. "Z. Ober-schl. Bergmaenn. V." vol. 51. May 1912. pp. 197-214. 5 fig. (Manufacture, properties, results of tests in the laboratory and in practice.) 40c.

Water-soluble Explosives. (Wasserloesliche Schiesspulver) F. Raschig. "D. Chem. Ztg." 1912. p. 632. 40c.

List of Powders and Explosives on the Market for Use in Mines. (Liste des poudres et explosifs mis en vente pour servir aux usages des mines.) "Ann. Mines." vol. 1. 1912. 4. pp. 246-47.

On Electric Blasting. Ueber das Elektrische Schiessen.) P. Humann. "Kali." vol. 6. 10. 15 May, 1912. pp. 221-6. 3 fig. 4 ill. 30c.

The Dangerous Influence of Electric Mine Locomotive Working on Blasting with Electric Ignition. (Gefaehrdung der Schiessarbeit mit elektrischer Zuendung durch den elektrischen Grubenlokomotivebetrieb.) "Glueckauf." vol. 48. 21. pp. 821-3. 5 fig. 75 c.

Accidents from Explosives in 1911. "Colliery Guard." vol. 103. 2687. pp. 1293-4. (Dealing largely with the report of H. M. Inspectors on blasting, and the ignition of coal dust and fire-damp from permitted explosives.) 15c.

VII—TIMBERING, PACKING, ETC.

Notes on Stope Timbering and Hand Stoping on the Rand. "S. Afric. Min. Jl." vol. 10. 481 pp. 583-4. 3 fig. 50c.

VIII—WINDING AND HAULAGE

Economic Haulage from Great Depths. (Wirt-schaftliche Schachtfoerderung aus grossen Teufen.) Aachen Dissertation. pp. 4-38.

Electric Hauling. (Elektrische Foerdermaschinen) Pamphlet published by the Siemens Schuckert Co. 5 ill. 7 fig. (The most important systems and a comparison. Data obtained by experience which facilitate a comparison.)

IX—LIGHTING

Flame-proof Electric Lamp. (Schlagwettersichere Gluehlichtarmatur) Brunnenbusch. "Glueckauf." 1912. p. 879. 75c.

The Safety Lamp. (Die Sicherheitslampe.) A. Rzehulka. "Kohleninteressent." 1912. p. 123. 50c.

French Employment of Acetylene Lamps in Mines. "Acetylene." vol. 9. 104. p., 140. (The method of use and management of the 12,000 lamps used in 51 mines of the French Lorraine iron district.) 25c.

X—VENTILATION

Points in Mine Ventilation. J. T. Beard. "Coal Age." vol. 1. 35 p. 1135-7. (The article deals with the multiplicity of theories, involving some popular fallacies, in mining textbooks. Misconceptions as regards the diffusion of gases, the limit of their diffusion, the detection of carbon monoxide in mines not made by observing the lamp flame. Mistaken relation of pressure and power by early writers, manometric efficiency of fans.)

A Ventilating System without Doors. J. H. Nelms, "Coal Age." vol. 1. 35. p. 1138 (The substitution of overcasts for doors in modern mines. Some unique and economical features are embodied in the system described; which is designed to accomplish this.)

Electric Mine Locomotives. (Elektrische Grubenlokomotiven.) W. Ohl. "Aeg. Ztg." 1912. 11. pp. 1-5. 9 ill. (Description of types built by the A. E. G. Locomotives for overhead current supply and accumulator locomotives.) 30c.

The New Century Mine Locomotive. "Motor Traction." vol. 14. 381. pp. 583-5. 8 fig. (A specially designed locomotive for underground haulage. Notes of work performed in a Cumberland lead mine.) 25c.

XI—MINE GASES, TESTING

Ignition of Gases by Electric Lamps. (Entzuendung von Gasen durch elektrische Lampen.) T. Hortens. "Zts. Zentr. Bergb. Betrbsl. Oest." 1912. p. 336. (Tests on the supposed inflammability of firedamp on exposure to the incandescent filaments of broken electric lamps.) 40c.

Detection of Gases in Mines. G. J. Rollandet. "Min. Sci." vol. 65. 1688. pp. 471-2. 3 fig. 40c.

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Austrian Coal-Dust Experiments. "Colliery Guard." vol. 103. 2688. pp. 17-8. 3 fig. (Results of experiments on concentrated wet zones, and the stability of barrier doors in coal dust explosions. 15c.

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Jamage Mine Fire and Explosion. "Coal Age." vol. 1. 36. pp. 1180-82. 3 fig. 1 plat. (Mine fires in England have hitherto been mostly in non-gaseous mines. The attempt to close in the gassy Jamage workings caused an explosion. The chief inspectors report explains why it took 27 hours for the construction of three stoppings in passages only eight to twelve feet wide.)

XIV—RESCUE AND AMBULANCE

Mine Rescue Equipment at the Royal Mining School. (Grubenrettungswesen an der kgl. Bergschule) "Saarbr. Bergmanns. Kal." 1912. p. 42-91. $2.50.

XV—PREPARATION

Dortmund Washery at the Holbrook Colliery. "Iron Coal Trade Review." vol. 85. 2314. pp. 1-2. 4 fig. 1 dble. plate. 30c.

XVI—BRIQUETS

Agglomeration of Fine Materials for Commercial use. W. S. Landis. "Min. Sci." vol. 65. 1689. pp. 489-90. (Application of briquetting methods to coals; ore concentrates, flue dust, scrap metal and similar products; notes on selection of binders.) 40c.

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The Examination of Coke for Metallurgical Purposes. (Die Untersuchung von Giessereikoks.) "Eisenztg." vol. 33. 18. pp. 301-8. 19 p. 331-3. 40c.

On Coking Plants and their By products. (Ueber Kokerein und Gewinnung der Nebenprodukte) Kuehl. "Techn. Mitt. Nachr." 1912. 11. pp. 271-5. 6 fig. (Development of Coking. The growth of the field of application of coke-oven gas. Development of the output of by-Products.) 30c.

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A Laboratory Method for the Comparison of the Coking Properties of Coal. R. Lessing, "Colliery Guard." vol. 103. 2687. pp. 1291-2. 4 fig. 1 tab. 15c.

Coal Analysis. "Jl. Gas Light." vol. 118. 2563. pp. 977-82. 2 fig. 4 tab. (Deals with the scientifically defined characteristics, apart from special agreement; the definition and qualities; physical composition or classification; the calcination in the crucibles, the volatile matter and the coke.) 30c.

Notes on the Impurities in Coal. F. R. Wadleigh. "Coal Age." vol. 1 37. pp. 1206-9 4 tab. (A practical monograph on the impurities in coal and the clinkering of fuels with the causes and remidies for the same.)

XIX—STEAM ENGINES AND BOILERS

Automatic Stoking in the Boiler House of the Mines de Dourages Company, Frances. "Iron Coal Tr. Rev." vol. 85. 2314. pp. 4-5. 5 fig. 30c.

XX—ELECTRICITY

Central Station Power for Coal Mines. G. Bright. "Coal Age." vol. 1. 35. pp. 1139-42. 8 tab. (The author takes as an example a typical coal-mining installation and figures the comparitive costs of electrical central station and locally generated power, showing the possible saving, which may be effected by use of the former. A discussion of data and methods for determining power costs follows.)

XXI—SURFACE TRANSPORTATION

Rochdale Coal Store and Gantry. "Archit. build. Jl." vol. 35. 909. pp. 643-5 7 fig. (Details of construction of reinforced concrete auxiliaries to an installation of vertical retorts at the Rochdale Corporation gas works.) 25c.

Aerial Ropeway at the Blaydon Burn Pits of the Priestman Collieries, Ltd. "Iron Coal Trade Review." vol. 84. 2313. p. 1037. 6 fig. 30c.

XXII—SANITATION, DISEASES

Coal Mine Waste, and Water Pollution. C. B. Dudley. "Water" vol. 14. 159 pp. 60-2. (The peculiar solution containing a high percentage of Calcium sulphate, free sulphuric acid and iron discharged into the Lackawanna River, Pa. from the coal mines; attention is drawn to the curious coagulating effect of the acid waste on the sewage.) 30c.